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The Marine Observer

A quarterly journal of Maritime Meteorology

Volume XXI No. 151

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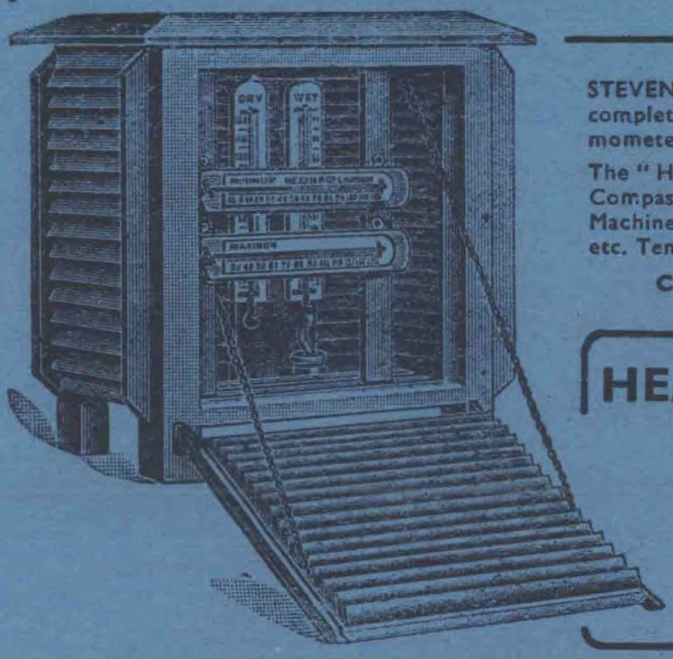

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THE MARINE OBSERVER

A Quarterly Journal of Maritime Meteorology prepared by the Marine Branch of the Meteorological Office

Vol. XXI

1951

By permission of the Honourable Company of Master Mariners

VISIT OF THEIR MAJESTIES THE KING AND QUEEN TO H.Q.S. " WELLINGTON ", 27TH OCTOBER, 1950

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M.O. 546 AIR MINISTRY

THE MARINE OBSERVER

A Quarterly Journal of Maritime Meteorology

prepared by the

Marine Branch of the Meteorological Office

VOL. XXI No. 151 JANUARY, 1951

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EDITORIAL

As the old year fades into retrospect and the new year with all its uncertainties steps somewhat shyly on to the stage, there is a lot to say in favour of the old custom of making some good resolutions. Even though the road to hell be paved with good intentions, it is also undoubtedly true that "saints are only sinners who keep on trying," and the birth of a new year gives us all, perhaps, some inspiration to try a bit harder, whether it is concerning our morals, our work, or even in the domestic sphere.

To the Scotsman, the birth of the new year is perhaps fittingly a celebration indeed, but to the Englishmen it pales into insignificance beside the festivities of Christmas. But to all of us, however we celebrate its arrival, New Year's Day has a significance, even though our thoughts are tinged with sadness at the memory of at least some pleasant event which has taken place during the old year, and also, perhaps, because its passing means we are one year older.

With the passing of the nineteen hundred and fiftieth year of the Christian era, one wonders, when one surveys the world, how far humanity has really advanced, despite our boasted civilisation and our scientific accomplishments of which we are all so proud. Human weaknesses seem as prominent as ever, and the trouble seems to be that they are perpetuated in national and international affairs, and we still find that half the world cordially dislikes and does not understand the other half. Can we ordinary citizens of the world hope that, as a New Year resolution, the statesmen (and indeed the common men) of all countries will increase their efforts to really get together so that trade can flow more freely and we can all enjoy the blessings of the earth?

In the realm of international affairs, there is probably no body of individuals which does more for the common good on an entirely voluntary and unpaid basis than the meteorological observers at sea. And this is international work which has gone on unceasingly, except for the period of two world wars, since 1855; it has had little publicity and has cost almost nothing—a rather remarkable record. It is almost entirely due to the work of these amateur sea-going meteorologists that we know as much as we do about the weather and the ocean currents of the world, and this is an extremely important subject when one considers how weather affects almost everything we do, and the enormous part that the physics of the oceans play in the composition and behaviour of the atmosphere—but we still need to know a lot more about the weather.

As a result of the activities of the International Meteorological Organisation, the Voluntary Observing Fleet of the world totalled in August, 1950, about 2,300 vessels of all nations, including Supplementary Ships. Of this total, Great Britain contributed 500 Selected Ships and the British Commonwealth total amounted to no less than 656. This is a fine contribution by the Merchant Navy officers and, indeed, by the shipping industry of the British Commonwealth towards the solution of many meteorological problems, not only for this country but also for the world in general. And, indeed, it is a fine effort by the merchant shipping of all countries, and is in keeping with the tradition of the seaman, no matter what his nationality. For the seaman was ever somewhat unselfish and broad-minded and, being a lover of nature, a scientist at heart.

Taking into account the fine work he is doing, and the tradition he has

built up, the voluntary observer at sea can himself perhaps usefully usher in 1951 with a few good resolutions as far as his meteorological work is concerned. This does not infer that his work is not good already—there is ample evidence that it is good—but as in all things there is usually room for improvement. The voluntary observer of the weather at sea is really an amateur meteorologist, although, as a mariner, weather is almost part of his profession. The very word " amateur " (Latin *amator*—a lover) is defined in the dictionary as " One who loves, is fond of, or has a taste for anything ", and the lover surely will do the best for the object of his devotion.

Wet and dry bulb readings are an outstanding example of a difficult observation to make at sea, and there is little doubt that unless the portable thermometer screen is hung on the weather side the readings are almost valueless. And that seems a pity, because these hygrometer readings, if accurate, can be extremely useful to the ship from the care of cargo viewpoint.

Sea-water temperatures tend to be inaccurate unless the reading is taken immediately the sample of water is hove on deck. All instrumental observations need care to ensure accuracy. Cloud types and cloud heights are very difficult to assess at times—but there is a personal satisfaction in feeling that they have been carefully and painstakingly observed—while wind and visibility observations, although both so natural to a seaman, need great care and judgment if they are to be accurate.

If one is observant and painstaking with a job one does voluntarily, how much more so will one be with one's profession ? It does seem that the marine observer at sea might perhaps appropriately start the new year with a meteorological resolution, embracing thoroughness and care; and the accomplishment of that good intention will perhaps help him with his profession as a seaman in some small measure.

On behalf of the Director and the whole staff of the Meteorological Office, we wish our readers safe and pleasant voyages throughout 1951, as well as health and happiness.

MARINE SUPERINTENDENT.

THE KING AND QUEEN VISIT THE WELLINGTON

The 28th October, 1950, was a memorable day for the Honourable Company of Master Mariners and thus for the whole Merchant Navy, for it marked the occasion of a visit by Their Majesties the King and Queen to their headquarters ship *Wellington*, which is permanently berthed alongside the Thames Embankment. It might be mentioned that His Majesty is Admiral both of the Merchant Navy and of the Honourable Company.

Members of the Honourable Company and their wives had the pleasure of being present aboard the ship and of witnessing the arrival of Their Majesties alongside, where they were greeted by the Mayor of Westminster, the Lord Mayor of London, Air-Chief Marshal Sir Frederick Bowhill, Master of the Honourable Company, Lady Bowhill and the Clerk to the Company. A guard of honour was mounted by the Royal Naval Volunteer Reserve, and contingents of the Sea Cadet Corps were also drawn up on the terrace alongside the ship. As Their Majesties boarded the ship the royal standard was broken at the mainmast. The King inspected representative cadets of the Nautical Training Establishments *Conway*; *Worcester*;

Pangbourne Nautical College; Gordonstoun Nautical School; *Arethusa*; *Indefatigable*; School of Navigation, Southampton; Junior Nautical School, Cardiff Technical College; Kingston-upon-Hull High School for Nautical Training; Trinity House Navigation School, Hull; Royal Technical College, Glasgow; City of Liverpool Technical College Nautical Department; King Edward VII Nautical College, London; and the Marine School, South Shields. There were also two cadets of the Honourable Company of Master Mariners.

The Wardens and Members of the Court of the Honourable Company with their ladies, together with a number of distinguished guests connected with the shipping industry, had the honour of being presented to Their Majesties in the Court Room. The King and Queen, accompanied by Sir Frederick and Lady Bowhill, then inspected the ship. Members of the Honourable Company and their ladies lined the quarterdeck during Their Majesties' inspection. A photograph was later taken of the King and Queen with the Wardens and Members of the Court.

On this important royal occasion, it is pleasant to record that the weather was fine, but the wind being from the east, the guests who were standing on the quarterdeck were very grateful for the tea which was later served in the somewhat warmer atmosphere of the Court Room after Their Majesties had left the ship.

C. E. N. F.

AUSTRALIAN METEOROLOGICAL SERVICE

We regret to announce the death at Adelaide on 5th August, 1950, of Mr. H. N. Warren, Director of the Australian Meteorological Service, while on his way back to Melbourne from a Meteorological Conference in Switzerland. Readers of *The Marine Observer* who have traded to Australia will know how helpful that Meteorological Service is to shipping, and they may like to know that Mr. Warren displayed a keen personal interest in the maritime side of meteorology, for he realised the importance to his country of ship observations from the vast Pacific Ocean, and at the same time the value to shipping of an adequate meteorological service.

Born at Melbourne in 1888, he was educated at the University of Melbourne. He held administrative posts in more than one Government Department before joining the Meteorological Department in 1938. He became Director of that Service in 1940. During the 1914–18 war he was on active service with the Australian Forces, and during the second World War played an important part in organising a meteorological service for the South-west Pacific campaign, afloat, ashore and in the air.

He was chairman of the Empire Conference of Meteorologists in London in 1946, one of the results of which was the close degree of co-operation which prevails at present between the countries of the British Commonwealth, as far as maritime meteorology is concerned.

He was a member of the Maritime Commission of the International Meteorological Organisation, and although not a seaman, always showed great interest in that Commission's work. At the Conference of Directors he was a prominent figure, and his business ability, judgment and sense of fairness earned universal respect. He had a robust personality and called a spade a spade, and he was a pleasant person to meet. His death is a loss to world meteorology.

C. E. N. F.

The Marine Observers' Log

JANUARY, FEBRUARY AND MARCH

The Marine Observers' Log is a quarterly record of the most unusual and significant observations made by mariners.

The observations are derived from the logbook of marine observers and from individual manuscripts. Photographs or sketches are particularly desirable.

Responsibility for each observation rests with the contributor.

LINE OF DEMARCATION

Caribbean Sea

M.V. *Port Chalmers.* Captain H. W. Hazlewood. Colon to Curaçao. Observer, Mr. S. H. Stewart, 3rd Officer.

14th January, 1950, 1730 G.M.T. Vessel passed from blue to light-green water extending in a well-defined line in a NW'ly direction from the region of Gallinas Point. The boundary between blue and green water was very distinct and visible at 5 miles, indicating shallow depths. The echo sounder was on, recording 107 fathoms, which remained constant after crossing dividing line. Sea temperature fell from 75°F. to 68°. At 1748 the vessel crossed the 100-fathom line, the depths falling to 40 fathoms. Weather conditions: moderate NE×E breeze, moderate sea and swell, fine, clear and cloudless. Barometer 30·06 in., temperature: air 78°F., sea 75° to 68°. Course 090°. Speed 14 knots.

Position of ship: Latitude 12° 32'N., Longitude 71° 45'W.

Note. During most months of the year there is a belt of relatively cool water along the coast of Venezuela and part of the coast of Columbia westward of this. There is probably some degree of upwelling along this coast due to the prevalence of the easterly trade wind, which tends to drive waters away from the coast. The line of demarcation observed by M.V. *Port Chalmers* may probably be accounted for as a boundary between this cooler green water and the blue water of the west-going Equatorial Current farther off shore.

DISCOLOURED WATER

Mozambique Channel

M.V. *Haparangi.* Captain C. R. Pilcher, O.B.E. Montevideo to Las Palmas. Observer, Mr. J. T. Peattie, 2nd Officer.

26th January, 1950, 1455 to 1510 G.M.T. The ship passed through patches of discoloured water of varying size running 130°–310°. The mean depth obtained by echo sounder was 25 fathoms. From 1510 to 1513 the depth increased from 40 to 600 ft.; at which point it left the scale. A sample of the water revealed a sandy substance. Both sea and air temperature stood at 82°F.

Position of ship at 1455 : Latitude 17° 45′S., Longitude 37° 38′W.

Gulf of Panama

M.V. *Port Wellington.* Captain E. J. Syvret. Sydney to Balboa. Observer, Mr. W. E. Bell, 3rd Officer.

11th February, 1950, 1915–1925 G.M.T. Vessel sailed through numerous large patches of discoloured water of a very distinct reddish-brown colour. Sea temperature remained unchanged at 78°F.

Position of ship : Latitude 4° 47′N., Longitude 80° 05′W.

PHOSPHORESCENCE

North Atlantic Ocean

S.S. *Empire Martaban.* Captain E. Pleasance. Casablanca to Durban. Observer, Mr. W. Mottram, Chief Officer.

31st March, 1950, 0555 G.M.T. The vessel passed through a line of " white water " which extended some 4 miles in an E–W'ly direction, and at a distance of some 300 yards looked like the crest of a " comber ". A few minutes later three large patches of phosphorescence were observed lying roughly in the same direction. Wind N, force 3, slight sea, cloudless sky, very good visibility.

Position of ship : Latitude 17° 00′N., Longitude 17° 47′W.

South Pacific Ocean

S.S. *Northumberland.* Captain L. W. Fulcher. Auckland to Balboa. Observer, Mr. T. G. Fuller, 3rd Officer.

11th January, 1950, 0920 and 1030 G.M.T. Passed several phosphorescent patches ; one relatively small patch estimated to be about 20 ft. in diameter. On both occasions the patches had the appearance of a strong light shining under water and the surrounding sea, particularly at 1030, appeared to be covered with twinkling lights. The patches were in a N–S line and were visible at a distance of 1 mile or more.

Position of ship at 0920 : Latitude 36° 26′S., Longitude 159° 00′W.
at 1030 : Latitude 36° 26′S., Longitude 158° 43′W.

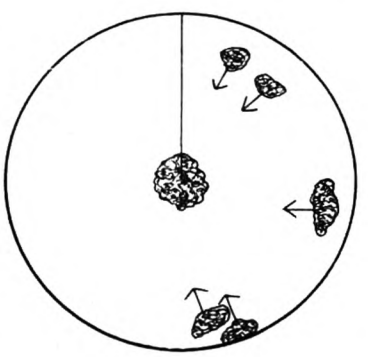
RAIN SQUALLS ON RADAR P.P.I.

North Atlantic Ocean

S.S. *Manchester City*. Captain F. L. Osborne. St. John, N.B., to Manchester. Observer, the Master.

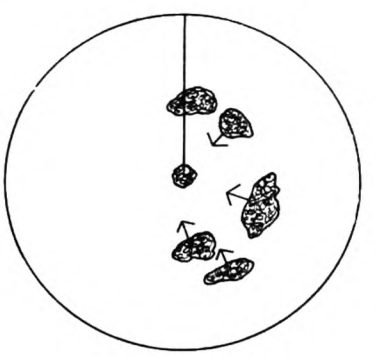
RADAR P.P.I. 12 MILE RANGE

Ship's head (heading line) is 090°



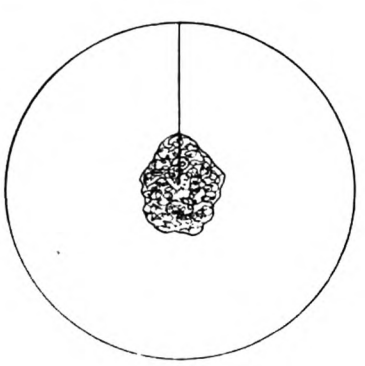
0430 G.M.T.

Wind : ESE, force 5. Weather : orq. Barr. : 983·5 mb.



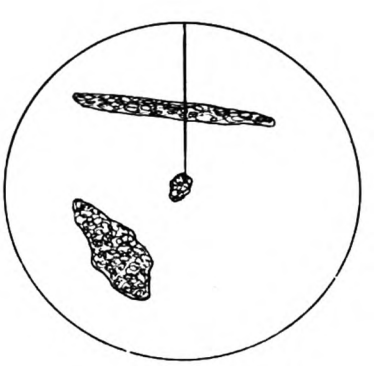
0435 G.M.T.

Wind : ESE, force 5. Weather : orq. Bar. : 983·5 mb.



0440 G.M.T.

Squall of hurricane force from WSW to ESE and deluge of rain. Bar. rose 5·5 mb., then fell 10·5 mb., then went back to 983·5 mb.



0450 G.M.T.

Wind : ESE, force 5. Weather : orq. Bar. : 983·5 mb.

24th March, 1950, 0430 G.M.T. The weather was heavily overcast with rain squalls and poor visibility. The wind was ESE, force 5, barometer 993·5 mb. and our course 090°. At 0430 several rain squalls showed on the P.P.I. bearing 110°, 170° and 260°, at a distance of about 7½ miles from the ship and apparently converging on it. At 0440, when they were all less than ½ mile away, a wind of hurricane force struck the ship from the WSW, and without abating backed to ESE in under two minutes, accompanied by a deluge of rain. During this period the barometer rose 5·5 mb., then fell 10·5 mb. and finally returned to 993·5 mb. The night was too dark to observe cloud formations.

Position of ship : Latitude 43° 16′N., Longitude 58° 50′W.

Comments upon this report are as follows :

Meteorological Office. From an examination of synoptic charts for 24th March, it appears that at the time in question the *Manchester City* was very close to the point of occlusion of a depression centred near Cape Cod. The ship must have passed through a severe squall or even close to a waterspout on the occlusion or cold front.

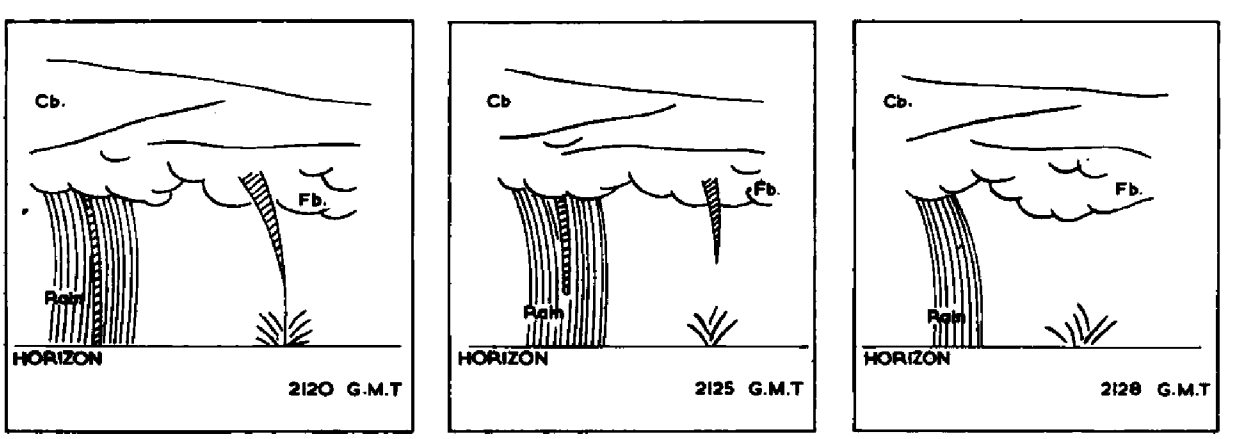
The frontal system was aligned broadly from NW to SE on our synoptic charts but the orientation might have been slightly different over the ship. It is suggested that the effect of converging echoes could be produced if the radar was seriously screened in limited sectors and a broad frontal rain area were approaching from the south.

Ministry of Transport (Operational Research Group), Marine (Navigational Aids) Division. Radar echoes on various but constant bearings, closing on a ship and maintaining equal ranges from it, can often be explained as being due to one true echo and its reflections in prominent parts of the ship's superstructure, such as funnels and samson posts. But in the case of the *Manchester City* (which incidentally was the ship featured in the radar film *In All Weathers*) there is, apart from minor screening by the top sections of the fore- and aftermasts, a good clear view all round from the radar aerial; and there appear to be no objects on the bearings mentioned in the report that would be likely to cause indirect echoes. In the absence of more information—for instance, a description of the echoes stated to be rain squalls would be of value, while one is curious as to their fate after leaving the ship—it does seem that all three echoes were true ones, and that the ship happened to be in rather interesting meteorological circumstances.

WATERSPOUTS

Bahama Islands

M.V. *Port Pirie.* Captain F. W. Bailey, M.B.E. At Nassau. Observers, Mr. E. Cliffe, 2nd Officer, and Mr. J. Martyn, 3rd Officer.



17th February, 1950, 2120–2130 G.M.T. Waterspouts as depicted in the sketches were observed to the eastward. The tongue of the lesser spout was joined to the sea column for a period of about two minutes. The cloud consisted of 5/8 Cb. with Fb. below, with a base estimated at 1,500 ft. Air temperature, 74°F., wet bulb 69°. Wind 230°, force 3. Rain in the vicinity.

LIGHTNING

North Atlantic Ocean

S.S. *Fort Spokane.* Captain W. T. Fitzgerald, R.D., R.N.R. London to St. John, N.B. Observer, Mr. D. A. Davies, 3rd Officer.

21st February, 1950, 0030 G.M.T. It was overcast and snowing when, with the wind shifting from SE to NW, a display of lightning began. Both the air and sea temperatures were 38°F. At 0100 a very bright flash was observed ahead over an arc of the horizon of about 80°, bearing 230–310° and extending to an altitude of 20°. It appeared to be coloured red and blue and was intensely brilliant. At 0110 a similar flash coloured yellowish green was seen. Heavy rolls of thunder were heard after both flashes. Normal lightning continued until 0145.

Position of ship : Latitude 43° 28′N., Longitude 57° 10′W.

ST. ELMO'S FIRE

North Atlantic Ocean

S.S. *San Felix.* Captain C. Summers. Southampton to Curaçao. Observer, Mr. R. Wilkinson, 2nd Officer.

14th March, 1950, 0300–0305 G.M.T. Corposants or St. Elmo's Fires appeared in the form of numerous small globes of luminosity attached to the ship's wireless aerial and to a lesser extent to other parts of the ship's rigging. There had been lightning in all quarters and violent hail squalls in the past hour. At the time of observation there was no lightning and slight drizzle was falling. The cloud consisted of 7/8 Cb. Barometer 995·9 mb. Air 53°F., sea 56°, dew point 47°. Wind 240°, force 8. Visibility good.

Position of ship : Latitude 41° 37′N., Longitude 25° 50′W.

SMOKE HAZE

Australian Waters

S.S. *Orion.* Captain N. A. Whinfield. London to Australia. Observer, Mr. P. Leighton, Junior 3rd Officer.

15th March, 1950, 0515 G.M.T. After rounding Cape Leeuwin in dense smoke haze we encountered eerie and weird phenomena. When 50 miles off Albany, noon suddenly became as midnight. The sun, on whose face five sunspots had been visible, was completely blacked out for a period of 28 minutes, making the use of lights a necessity. The wind backed from N to S within seconds. Previously, vivid colours, from fiery yellow to delicate pinks, had been observed in the sky, and the air was laden with charred bay leaves, bark and wood ash. The ship was 8 miles from the nearest land. The master had not previously seen such phenomena in 27 years at sea.

Note. Smoke from forest fires is not infrequently observed in this region but has rarely, if ever, been seen so intense. In this case the smoke and charred matter in the lower air was so thick that the sun was completely obscured. When finely-divided smoke or dust reaches the upper atmosphere in considerable quantity it may cause the sun or moon to appear of a blue or green colour. Such blue suns and moons were observed in the British Isles and Western Europe during the period 26th to 28th September, 1950, and this was attributed to smoke from great forest fires in western Canada crossing the Atlantic at upper-air levels.

CLOUD EFFECT

South Atlantic Ocean

M.V. *Capetown Castle.* Captain R. Wren, D.S.O. Southampton to Cape Town. Observer, Mr. D. Lamb, 4th Officer.

31st March, 1950, 1845 G.M.T. A particularly large Cb., base about 4,500 ft., was silhouetted against the sunset and precipitation was observed from one portion of its base (Fig. 1). After 5 or 10 minutes the precipitation

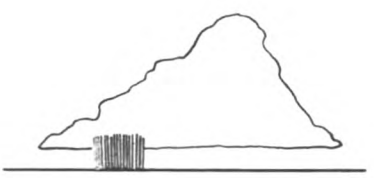


Fig. 1

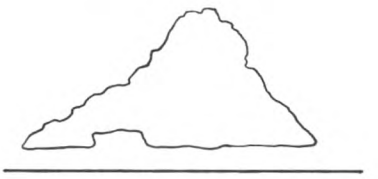


Fig. 2

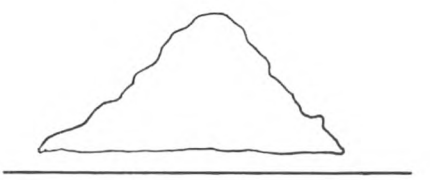


Fig. 3

ceased and a space in the lower part of the cloud was apparent, as though part of the bottom of the cloud had dropped into the sea (Fig. 2). After a further 5 minutes or so the base of the cloud had formed up again (Fig. 3). The altitude of the top of the cloud was about 30°.

Position of ship : Latitude 2° 23'S., Longitude 7° 02'W.

CLOUD PHOTOGRAPHS

Australian Waters

M.V. *Port Wyndham.* Captain E. E. Roswell. Cape Town to Adelaide. Observer, Mr. M. E. Field, 3rd Officer.

12th January, 1950. When off Kangaroo Island, South Australia, observed mammato-cumulus cloud as shown in photograph.

UNUSUAL VISIBILITY

North Atlantic

S.S. *Speaker*. Captain E. V. Dunn. London to Cape Town. Observer, Mr. J. B. Mitchell, 3rd Officer.

13th January, 1950, lat. 27° 40'N., long. 15° 25'W., 0945 A.T.S. Pico de Teide, Teneriffe, visible to naked eye at a distance of 78 miles. The peak remained clearly visible throughout the day until sunset, when in lat. 26° 20'N., long. 15° 45'W., it was bearing 339°, distance 125 miles.

IRIDESCENT CLOUD

Red Sea

M.V. *Cumberland*. Captain A. E. Williams. Suez to Aden. Observer, Mr. M. J. Heron, 2nd Officer.

1st January, 1950, 1200 G.M.T. Three small cirrocumulus clouds at about 5° from the sun showed very distinct colouration, appearing purple nearest the sun and green at the outside. The sun's altitude was 30°. The rest of the sky was 1/8 covered with cirrostratus and cirrocumulus.

Position of ship : Latitude 27° 35'N., Longitude 34° 00'E.

LUNAR RAINBOW

South Pacific Ocean

M.V. *Port Pirie*. Captain F. W. Bailey, M.B.E. Sydney to Balboa. Observer, Mr. J. Martyn, 3rd Officer.

31st January, 1950, 0925 G.M.T. A lunar rainbow was observed in the form of a clear and distinct white bow with a reddish outer edge, which reached an approximate altitude of 31° and was visible for 3 minutes. The cloud consisted of 2/8 Cu. at 3,000 ft. and 7/8 As., and there were light showers in the vicinity.

Position of ship : Latitude 4° 45'S., Longitude 94° 15'W.

LUNAR CORONAE

South Pacific Ocean

M.V. *Port Pirie*. Captain F. W. Bailey, M.B.E. Sydney to Balboa. Observer, Mr. J. Martyn, 3rd Officer.

30th January, 1950, 0832 G.M.T. A lunar corona and aureole was observed, the aureole as yellow-white and the corona as red-brown with a purple outer edge, the diameter of the corona being approximately 2°. The corona faded at 0900, but the aureole was visible until 0926 when the moon set. The cloud consisted of a trace of Cu. and As.

Position of ship : Latitude 8° 16'S., Longitude 99° 57'W.

1st February, 1950, 0800. The phenomenon was again observed, the aureole appearing blue-white and the corona red-brown with spectrum colours on the outside edge, the diameter of the corona being approximately $5\frac{1}{4}°$. The cloud consisted of 3/8 Cc. and 1/8 Ac.

Position of ship : Latitude 1° 31'S., Longitude 89° 08'W.

Note. The term " aureole " is not quite correctly used in the observations given above. It is usually applied by meteorologists to include both the inner glow, or field of light round the moon (or sun) and the red-brown ring which forms a boundary to this. In most cases this is all that is seen of a corona. When more fully developed

there are series of coloured rings outside the red-brown ring, in spectrum order, violet nearest the moon. The corona appeared thus in the observation of 1st February ; in that of 30th January there was only a trace of the violet ring outside the red-brown one. When most fully developed the series of coloured rings outside the red-brown ring (but not the red-brown ring itself) is repeated outwards two or three times. The second or third series of spectrum colours is usually too faint to be seen.

SOLAR HALOS

New Zealand Waters

T.S.S. *Tekoa.* Captain H. A. Horwood. Panama to Auckland. Observer, Mr. P. B. Eccles.

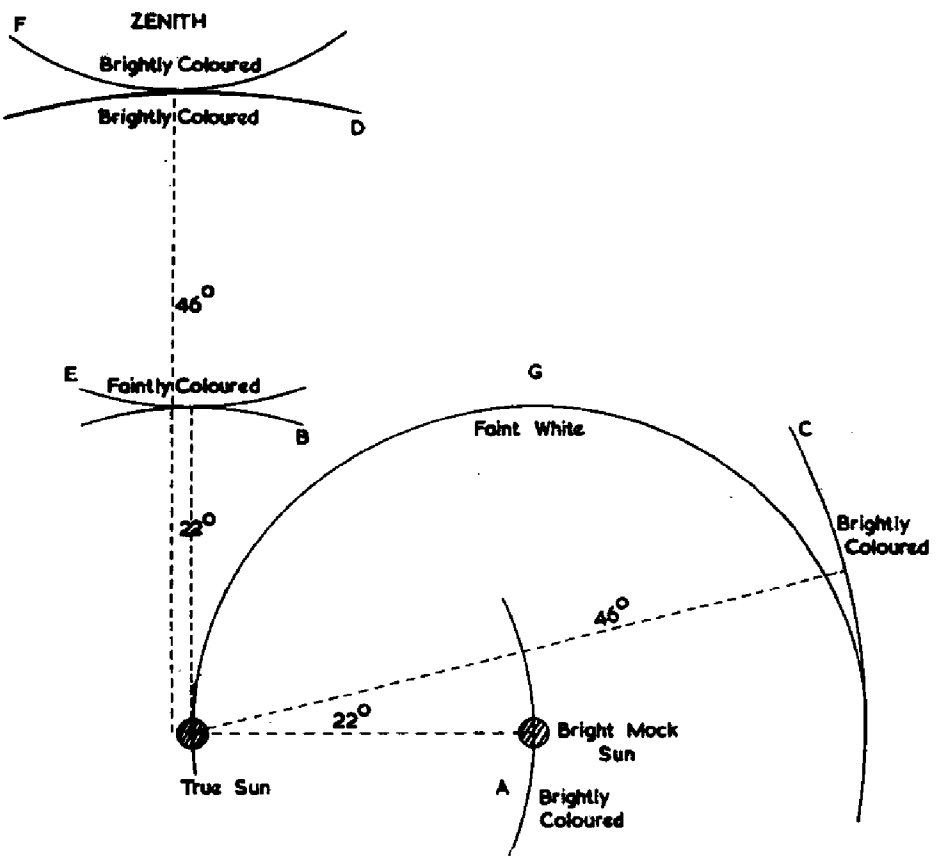
7th January, 1950. A perfect solar halo of $22\frac{1}{2}°$ radius was observed. The colours were well defined, starting with red at the inner rim, changing through yellow and green to a bluish-white at the outside. During the phenomenon, which was first observed $1\frac{1}{2}$ hours before noon at an altitude of $72\frac{1}{2}°$, fair weather Cu. was present in a belt low down on the horizon with a complete veil of Cs. above. The halo disappeared one hour after noon.

Position of ship : Latitude 36° 00'S., Longitude 176° 01'E.

North Atlantic Ocean

O.W.S. *Weather Explorer.* Captain H. R. Wilkinson, R.D., R.N.R. On Station JIG. Observer, Mr. J. Hodkinson, Meteorological Officer.

31st January, 1950, 1100 G.M.T. The accompanying sketch, drawn to scale, shows the solar halo phenomena observed. Arcs of upper contact



were visible at 22° and 46°, the latter being the most marked and brightly coloured. A parhelion was seen on the 22° halo. A bright arc of a 46° halo

and a faint white 22° arc with the parhelion as centre were observed. The latter could be seen to pass through the true sun. The weather was partly cloudy with variable Sc. and Ac. and extremely thin Cs. above. There were occasional snow showers in the vicinity.

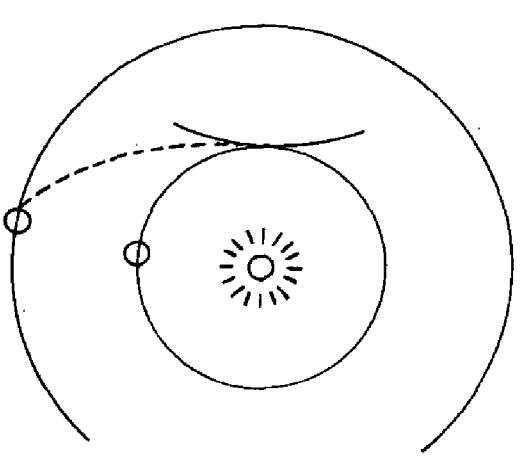
Position of ship : Latitude 53°·41′N., Longitude 18° 56′W.

Note. This is an interesting halo complex. Letters have been added to the sketch for reference. A and B are parts of the ordinary halo of 22° radius and C and D parts of the rarer halo of 46° radius. E is the arc of upper contact to the halo of 22°. The arc F, frequently called the arc of upper contact to the halo of 46°, is more correctly named the circumzenithal arc. It makes contact with the 46° halo only when the sun is at an altitude of 22°, but the separation does not exceed 1° for any solar altitude between 16° and 27°. At altitudes below 16°, however, the separation increases rapidly, and when the sun is on the horizon the circumzenithal arc is 12° above the highest point of the halo of 46°. Above a solar altitude of about 32° the circumzenithal arc cannot be formed at all.

The rarest part of the present observation is the secondary halo of 22°, lettered G. In the ordinary halo of 22° the light of the sun is the source of the light of the halo, which is formed by refraction through the ice crystals which constitute the cloud. The secondary halo is similarly formed from the light of the mock sun, on which it is centred. As this is much fainter than the real sun, the secondary halo is much fainter than the ordinary one, and so is almost always too faint to be seen, even when carefully looked for. Only a very few observations of this secondary halo have therefore been received from ships at sea. The secondary halo in the present observation passes through the sun because the mock sun is actually on the ordinary halo and the radii of both halos are equal. With higher altitudes of the sun, the mock sun lies at varying distances outside the ordinary halo and therefore the secondary halo would not pass through the sun.

O.W.S. *Weather Observer.* Captain N. F. Israel, D.F.C. On Station ITEM. Observer, Mr. T. L. A. Waite, Meteorological Officer.

3rd February, 1950, 1300 G.M.T. Solar halos of 22° and 46° were observed with an arc of upper contact on the former and parhelia on both. The colours were very bright on the 46° halo. A possible further arc was seen, as indicated in the sketch, but was not very distinct and may have been a shadow on the cloud.

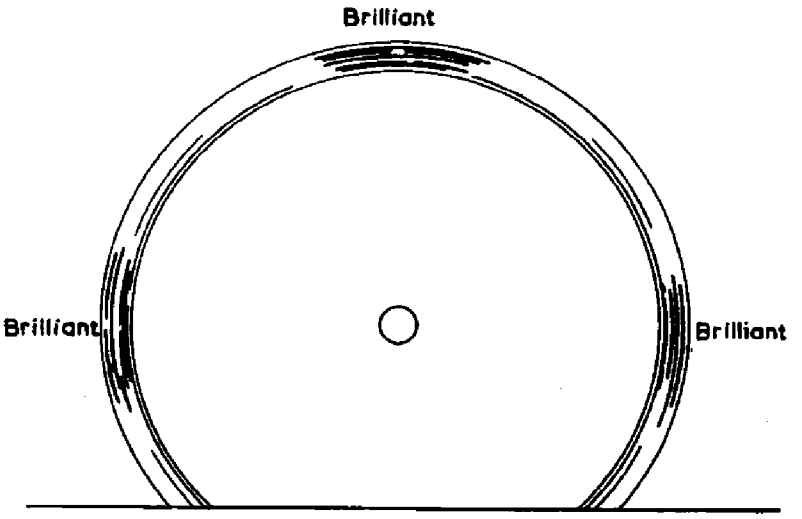


Position of ship : Latitude 59° 50′N., Longitude 20° 00′W.

Note. This is an interesting observation, as the parhelion (mock sun) of the 46° halo, though well known, is only rarely observed. It is probable that the doubtful arc was a curved wisp of cloud, since no known halo phenomenon occurs in this position. Sometimes such wisps and streaks of cloud resemble arcs of halos very closely, but usually the slight irregularities of the cloud arc or its gradual movement indicate that it is not a halo phenomenon.

O.W.S. *Weather Watcher.* Captain F. A. Elston. On Station JIG.

18th February, 1950, 1706–1745 G.M.T. A well-defined solar halo of 22° radius was observed. Brilliant patches, not sufficiently developed to appear as mock suns, were seen as indicated in the sketch. The halo was



coloured red, orange and white from the inner to the outer edge. The cloud consisted of 2/8 Sc. and 7/8 Ci. and Cs.

Position of ship : Latitude 53° 47′N., Longitude 18° 43′W.

Note. The brilliant patches east and west of the sun are rudimentary mock suns. The brilliant patch at the uppermost part of the halo is sometimes seen, as also may be a similar patch at the lowest part of the halo when this is visible. The 22° halo is formed by refraction through ice crystals suspended in the air with their axes lying in all possible directions. In time, however, the crystals tend to settle with their axes horizontal, and the bright patches at the top and bottom of the halo are an indication that a considerable proportion of the crystals are so oriented.

LUNAR HALO

North Atlantic Ocean

M.V. *Derryclare.* Captain G. Smith. Panama to Dublin. Observer, Mr. D. Kingsland, 3rd Officer.

5th January, 1950, 0100 G.M.T. A complete halo was observed of 25° radius and showing red on the inner edge. The greatest brilliancy was attained at 0115 G.M.T., when a second moon appeared, imposed on the true moon and appearing as would the moon if observed through a sextant set at 0° 10′ on the arc.

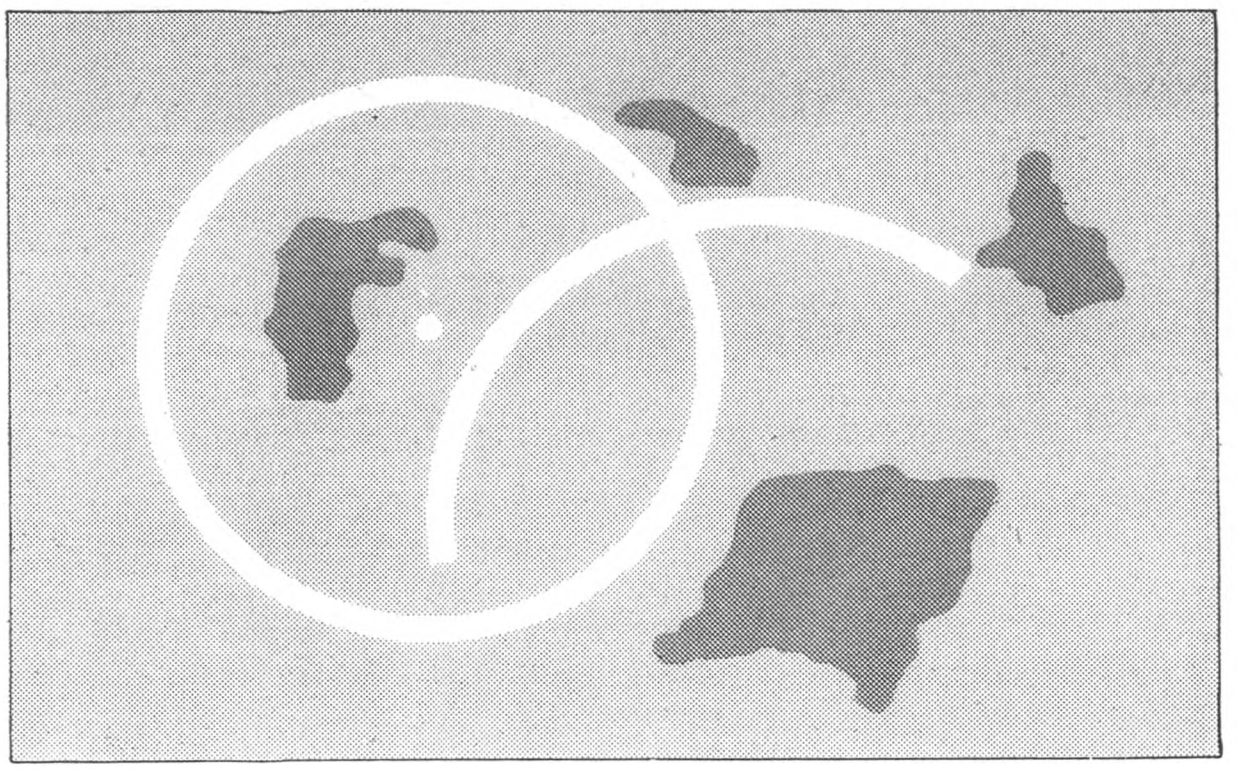
Position of ship : Latitude 46° 05′N., Longitude 22° 57′W.

Caribbean Sea

M.V. *Port Chalmers.* Captain H. W. Hazlewood. Curaçao to Colon. Observer, Mr. D. J. A. Pritchard, 3rd Officer.

7th March, 1950, 0630 G.M.T. A distinct lunar halo of radius 22° was observed. The halo was obscured from time to time by Cu. At 0640 an arc of a second halo, of apparently slightly larger radius, appeared. It intersected the primary and the outer perimeter passed to within about 2° of the moon, as shown in the sketch. The secondary was visible for 5 minutes,

after which the area became obscured by Cu. After a few minutes the primary was again observed, but the secondary had vanished. The moon, which was 20 days old, had an altitude of 65°. The cloud formation consisted of 4/8 Cu. and 3/8 Cs.



Mean position of ship : Latitude 12° 40'N., Longitude 71° 19'W.

Note. This is another interesting halo observation which cannot be fully explained. At first sight the arc of the halo intersecting the ordinary halo appears to be a secondary halo, such as was observed by O.W.S. *Weather Explorer*, see page 14. There are, however, two reasons why this cannot be the case : (i) that the halo is stated to be of slightly larger radius ; (ii) the altitude of the moon is 65°. A secondary halo cannot be formed with an altitude of the moon (or sun) greater than 60° 45′.

NIGHT SKY PHENOMENON

North Atlantic Ocean

S.S. *San Felix.* Captain C. Summers. Thameshaven to Aruba. Observer, Mr. R. Wilkinson, 2nd Officer.

1st February, 1950, 0425 G.M.T. Three bands of light of a uniform width of about 2° were observed apparently radiating from a point on the SW horizon and passing vertically overhead. The direction in which they were lying was roughly 220°. The bands were quite distinct even though the moon was shining brightly. The two lower, or S'ly ones stretched from the point on the horizon to a position 20° to the south of the zenith, beyond which they were obscured by cumulus. The third one lay to the north of the others and was much shorter, starting from a position directly overhead and fading away in a 040° direction, leaving a band of light which gradually diminished in intensity, the whole representing an angular distance of 15°.

Cloud prevented further observations until another large break occurred about 40 minutes later, when the three bands of light were again observed. A considerable movement must have taken place in the interval, for although

radiating from the same point they had wheeled round to the southward and the end of the lower or S'ly band was now about 15° above the horizon, still bearing S. No other change was apparent and they maintained their uniform straightness and spacing of about 3° when looking S, the angle gradually diminishing as the bands converged in the SW sector. The weather was cloudy with large breaks frequently occurring in the cumulus clouds and visibility was good. Course 243°. Speed 8 knots.

Position of ship : Latitude 35° 56'N., Longitude 38° 43'W.

Note. The observer suggests that the phenomenon described above was aurora. Aurora is uncommon in relatively low latitudes of the North Atlantic Ocean, but is occasionally observed. The frequency of occurrence of aurora in lat. 37°N., long. 40°W., is about one night in every 100 clear nights. Southward of this the frequency diminishes rapidly, and in latitude 26°N., long. 40°W., is about one night in every 2,000 clear nights. The frequency is a little higher in the same latitudes in more westerly longitudes of the North Atlantic Ocean. Aurora is usually only seen in those low latitudes, however, when there is a disturbance of the magnetic needle, constituting a magnetic storm. It would also normally be observed to the north of the zenith. On this date the daily range of the magnetic elements was comparatively small and the bands were observed mainly south of the zenith. It is possible, therefore, that they were bands of thin Cs. cloud illuminated by the moon.

AURORAE

North Atlantic Ocean

S.S. *Balantia.* Captain C. C. Dingle. London to West Indies. Observer, Mr. R. L. Collins, 3rd Officer.

20th February, 1950, 2335 G.M.T. A distinct aurora was observed extending from N–NW by N. A red glow appeared, quickly becoming brilliant, reaching an altitude of 30°. The brilliant glow lasted some 3 minutes, and vertical shafts of white light were seen through the centre. The glow faded gradually, the whole phenomenon lasting about 10 minutes.

Position of ship : Latitude 36° 35'N., Longitude 32° 08'W.

S.S. *Marengo.* Captain F. Barnard. New York to Hull. Observer, Mr. C. R. Tutty, 2nd Officer.

20th February, 1950, 2110 G.M.T. Aurora was observed curtaining from E–W across the N horizon to an altitude of 90°. The altitude at the E and W points was 30°. The phenomena was coloured red, white and gold. Low St. was apparent on the N horizon.

Position of ship : Latitude 49° 38'N., Longitude 8° 30'W.

M.V. *Port Pirie.* Captain F. W. Bailey, M.B.E. Nassau to New York. Observers, Mr. J. Martyn, 3rd Officer, and Mr. W. Wakefield, 4th Officer.

21st February, 1950, 0230–0830 G.M.T. Aurora appeared, bearing 320° to 020°, in the form of pale shafts of greenish light, which persisted until 0300, when a veil of light reaching a maximum altitude of 20° became apparent over the area. From 0400 to 0530 only a dull glow was apparent, but from 0530 to 0830 distinct " cloud " formations showing continuous flickering were observed.

Mean position of ship : Latitude 38° 48'N., Longitude 74° 10'W.

Mediterranean Sea

S.S. *City of Hereford.* Captain G. A. King. Trieste to Algiers. Observer, Mr. D. J. Mathews, 3rd Officer.

20th February, 1950, 2112 G.M.T. The sky became blood-red over an area between 340° and 020°, rising to an elevation of about 25°. The phenomenon lasted for about 10 minutes and then gradually disappeared. The sky was partly cloudy.

Position of ship : Latitude 38° 05'N., Longitude 11° 12'E.

S.S. *City of Windsor.* Captain W. S. Doidge. Port Said to Liverpool. Observer, Mr. T. H. Peirce, 3rd Officer.

20th February, 1950, 2100 G.M.T. Aurora of moderate brilliancy was observed between NNW and NNE, with an elevation of about 20°. The main colour was deep red, with four wide vertical rays and several lesser ones, all of a whitish colour and parallel to each other. The rays were only visible for a few minutes as the aurora reached its greatest brilliancy. There was a 2° belt of darkness adjacent to the horizon, probably due to a distant cloud formation. All trace of the phenomenon had disappeared by 2120.

Position of ship : Latitude 37° 25'N., Longitude 5° 00'E.

Australian Waters

T.S.S. *Perthshire.* Captain A. J. Hogg. Melbourne to Fremantle. Observer, Mr. M. P. R. Turner, 2nd Officer.

20th February, 1950, 1800 G.M.T. Aurora extended from 146°–240°, consisting mainly of spears of light, pale blue in colour, attaining an altitude of 25°. The display was most vivid from 146°–160° and 225°–240°, where the blue coloration gradually changed to pink and red. The phenomenon lasted for an hour and dispersed by dawn.

Position of ship : Latitude 38° 46'S., Longitude 142° 18'E.

Further observation of aurora on 20th February, 1950 :

O.W.S. *Weather Watcher,* in position 53° 53'N., 18° 37'W., reported " auroral glow at midnight ".

North Atlantic Ocean

O.W.S. *Weather Recorder.* Captain A. W. Ford. On Station ITEM.

21st February, 1950, 2300 G.M.T. No aurora visible. By 2320 a very bright display had developed consisting of three parallel, whitish-green curtain formations stretching from E–W through S. The lowest elevation was about 15° and the highest about 40°. By midnight the aurora had disappeared.

Position of ship : Latitude 60° 01'N., Longitude 20° 15'W.

Australian Waters

S.S. *Atlantis.* Captain A. R. Osburn. Wellington to Fremantle. Observer, Mr. C. W. Williams, 2nd Officer.

23rd January, 1950, 1620 G.M.T. A patch of red light was observed between 160° and 180°, rising to an altitude of 20° above the horizon. At

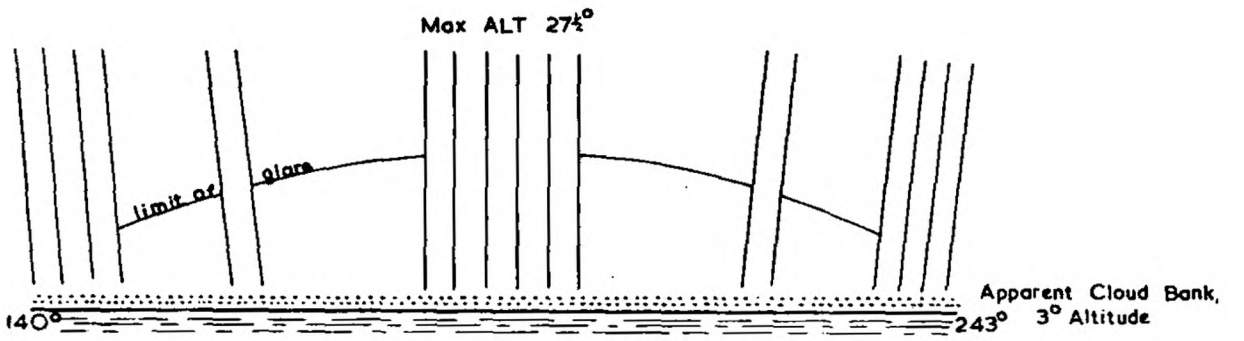
the centre, two beams of light, 2° in width, extended vertically from the horizon. As the patch of red light extended the beams disappeared. At 1630 a maximum width of from 150°–210° was reached, the western extremity then becoming obscured by cloud and the eastern edge receding. The phenomenon had completely disappeared by 1640.

Position of ship : Latitude 38° 23′S., Longitude 139° 03′E.

S.S. *Strathaird.* Captain H. S. Allan, R.D., R.N.R. Observer, Mr. R. Bullock-Webster, 2nd Officer.

24th January, 1950, 1600 G.M.T. When coming down the bay from Port Melbourne, Southern Lights were observed, but it was not until clear of the Heads that their full extent could be seen.

They took the form of a bright white light, rather similar to the glare given out by a large city at night, with vertical shafts of light resembling searchlight beams. These fluctuated in height, width and position, the maximum altitude being 27½°. The lights extended from 140°–243° true



The main colouring of the shafts of light was white, but this changed periodically to a light pink, often becoming a deep pink before turning to white again. No cloud was visible except for an apparent low bank, about 3° in altitude, on the southern horizon.

The whole phenomenon lasted until 1800 G.M.T., when dawn began to lighten the eastern horizon.

Position of ship : Latitude 38° 22′S., Longitude 144° 39′E.

New Zealand Waters

M.V. *Orari.* Captain F. Loughead. Wellington to Balboa. Observers, Mr. J. A. Edmondson, 3rd Officer, and Mr. W. J. Morton, 2nd Officer.

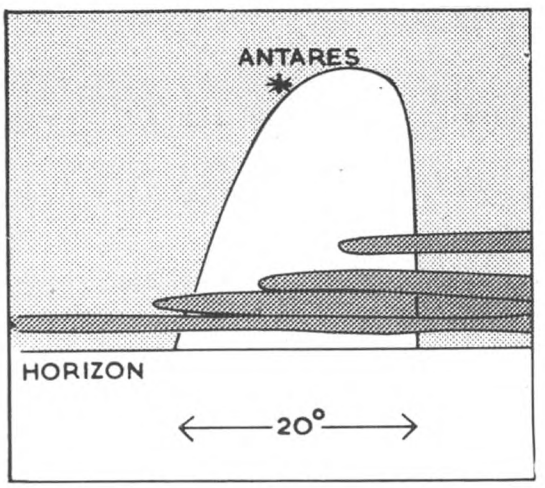
19th March, 1950, 0800 G.M.T. A glow was observed in the sky to the south. At 1100 it became more pronounced and at 1140 the sky between 160° and 230° (T) began to change colour. From the horizon to an altitude of about 15° the sky became pale blue ; between 15° and 25° it showed pink ; and from 25° to 40° a bright red. Broad rays of white light, radiating from a point below the horizon, reached an altitude of 45°. After half an hour the aurora faded rapidly and by 1220 had disappeared.

Position of ship at 0800 : Latitude 40° 56′S., Longitude 177° 07′W.

ZODIACAL LIGHT

South Pacific Ocean

M.V. *Port Pirie.* Captain F. W. Bailey, M.B.E. Sydney to Balboa. Observer, Mr. J. Martyn, 3rd Officer.



25th January, 1950, 1235 G.M.T. A white, milky-coloured cone of light was seen, bearing 110°, covering an arc of 20° at the horizon and rising to an altitude of approximately 36°. Its maximum brilliancy was equal to the greatest brilliancy of the Milky Way. The edge of the light was reasonably distinct though the base was partly obscured by As. The light faded at 1242.

Position of ship : Latitude 23° 34′S., Longitude 127° 57′W.

Note. The axis of the Zodiacal Light is not easy to determine on account of the diffuse nature of the phenomenon. The axis is known to correspond approximately with the Ecliptic, and it is believed that it forms a small angle of a few degrees with it at times. Whether this is always the case, and whether the small angle is constant, is not yet known. The cone of the Zodiacal Light, as shown in the sketch, makes a steep angle with the horizon because the ecliptic does so at the latitude and time of the observation.

METEORS

North Atlantic Ocean

S.S. *Empire Martaban.* Captain E. Pleasance. Casablanca to Durban. Observer, Mr. W. Mottram, Chief Officer.

31st March, 1950, 0505 G.M.T. A very bright meteor with practically no trail was observed in a clear sky. It appeared bearing 330° at an altitude of about 14° and travelled in a N'ly direction, disappearing when bearing 010°. Its speed was comparatively slow and its brilliance about equal to Arcturus (mag. about 0·5). The phenomenon lasted about 5 seconds.

Position of ship : Latitude 17° 08′N., Longitude 17° 48′W.

Mediterranean Sea

M.V. *Denbighshire.* Captain D. Hey. Port Said to Amsterdam. Observer, Mr. G. Bower, 4th Officer.

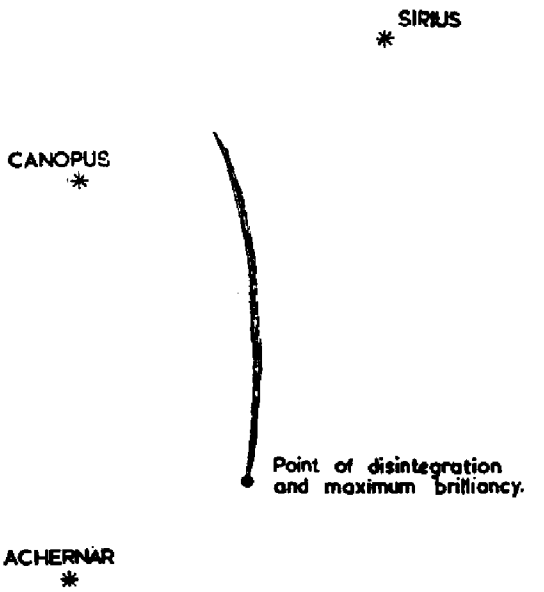
24th February, 1950, 1835 A.T.S. A remarkably bright meteor appeared at about 15° altitude, bearing 210°, and moved parallel to the earth's surface. When bearing 290° (approx.) it disappeared for a period of 2 seconds behind cumulus cloud, then came into view again and finally disappeared at about 20° altitude, bearing 355°. The fore part was white, more brilliant than Venus, the centre of varying intensity and the trail was coloured a dull reddish-orange. The period of duration was about 7 seconds.

Position of ship : Latitude 37° 25′N., Longitude 10° 26′E.

North Pacific Ocean

S.S. *El Gallo*. Captain P. Pedersen. Stanlow to Panama. Observer, Mr. J. Channing-Pierce, 3rd Officer.

17th March, 1950, 0247 G.M.T. A brilliant green flash, which illuminated the ship like lightning, appeared near Canopus behind a thin veil of As.



The meteor travelled down through about 10° to 15° of altitude at an angle to the vertical of about 45° and disappeared at about 220° (T). It was bright green in colour with a vivid red and yellow trail, the total length being about 1°. The magnitude was thought to be well in excess of Venus and the duration was about 1 to 2 seconds.

Position of ship : Latitude 4° 35′N., Longitude 80° 14′W.

Arabian Sea

S.S. *British Statesman*. Captain J. R. Lumby. Abadan to Las Palmas. Observer, Mr. S. B. Wade, Chief Officer.

2nd February, 1950, 0131 G.M.T. A bright meteor was observed in a cloudless sky. The main body was an intense bluish white, and the trail, which appeared to waver, had a distinct reddish tinge at the edges and tip. It appeared at an altitude of about 8° bearing 250°, and travelled in a S'ly direction, disappearing at an altitude of about 6° bearing 210°. The time of flight was about 3½ to 4 seconds, and the angle of run about 10° from the horizontal plane.

Position of ship : Latitude 16° 35′N., Longitude 54° 36′E.

South Pacific Ocean

M.V. *Salamanca*. Captain D. W. Hutchison. Observer, Mr. K. Williams, 3rd Officer.

14th February, 1950, 0216 G.M.T. Midway between Sirius and Canopus, and first appearing at an altitude of 70°, bearing 190° (T), a brilliant meteor was observed falling. The ship and sky were momentarily lit up by a blue-green glow, the maximum brilliancy being attained when the body disintegrated at about 30° altitude just above Achernar, after a flight of about 4 seconds. The sky was cloudless.

Position of ship : Latitude 17° 48′S., Longitude 71° 52′W.

THE VISIT OF U.S. COASTGUARD CUTTER "CASTLE ROCK" TO GLASGOW

In September, 1950, an unusual and welcome visitor who tied up alongside Plantation Quay, Glasgow, was the U.S. coastguard cutter *Castle Rock*, after a spell of 21 days' duty at Ocean Weather Station ABLE, situated off the east coast of Greenland in 62°N., 33°W. The object of this visit was to give leave to the ship's company after their somewhat monotonous and chilly vigil at ABLE, and to exchange views with the British authorities about practical aspects of the operation of ocean station vessels.

Commander Graves, captain of *Castle Rock*, was for many years engaged on ice patrol duties on the Grand Banks, was a meteorological adviser to the coastguard authorities at Washington, attended the first Weather Ship Conference in London, and was at the I.M.O. Conferences at Toronto and Washington in 1947. Mr. Hill, of the U.S. Weather Bureau, meteorological officer aboard *Castle Rock*, is a veteran sea-going meteorologist, having served in weather ships since their inception.

Commander Graves and some of his officers visited the British weather ship *Weather Observer*, which was anchored at the tail of the Bank. They inspected the vessel thoroughly, exchanged views with the officers and other technicians, and were entertained to lunch aboard. Later they saw an air/sea rescue exercise carried out, during which the wind attained Beaufort force 7, which raised quite an unpleasant sea even in the anchorage. They also witnessed a radio-sonde ascent.

The Marine Superintendent, the Shore Captain and the Master of *Weather Recorder* paid a return visit to Commander Graves, thoroughly inspected his ship and were entertained to luncheon. *Castle Rock* has a displacement of about 1,700 tons and a length of 312 ft., compared with the 1,400 tons and 205 ft. of the British Weather Ships, and being a coastguard cutter she has a crew of over 100. She is very roomy aboard and was spotlessly clean. The radio, radar and meteorological apparatus, together with the rescue equipment, although of different type, performs similar functions to that provided aboard the British Weather Ships. A modest oceanographical programme, including bathythermograph observations of temperature at various depths, is carried out.

This personal contact and exchange of views between those responsible for operating ocean station vessels, are surely beneficial when one considers that each Ocean Weather Station is part of an international chain working for the common good. The more efficiently and economically the ships are run, the better for the taxpayers of all the countries concerned; and the more regular and uniform the meteorological, navigational and radio service provided by the ships manning those stations, the better for the user, be he seaman, airman or landlubber.

C. E. N. F.

THE INTERNATIONAL OPERATION OF OCEAN WEATHER STATION "MIKE"

In accordance with the terms of the first Atlantic Weather Ship Agreement (London, 1946), the operation of Ocean Weather Station MIKE, situated off the Norwegian coast in position 66°N., 02°E., was the joint responsibility of Norway, Sweden and the United Kingdom, the operating cost being borne

in the proportions 22 per cent, 43 per cent and 35 per cent respectively. It was agreed between the three countries concerned that the United Kingdom would provide the two vessels necessary for operating the station and have them converted, fitted and stored to Scandinavian requirements, that Norway would man and operate the vessels, and that Sweden would provide financial contributions, the annual financial commitment of each country being adjusted from year to year as necessary.

Two "Flower" Class corvettes, *Saxifrage* and *Bryony*, were accordingly taken in hand at Chatham Dockyard, converted as necessary, and renamed *Polarfront I* and *Polarfront II*. The radio and radar apparatus, and also the navigational and life-saving equipment, was almost identical to that of the four British Ocean Weather Ships, and much of it was of Admiralty pattern. Both the British and the Norwegian Ocean Weather Ships are manned by civilian crews, but the Norwegian ships carry somewhat smaller crews than the British vessels and the accommodation had to conform to their national requirements, so that there was considerable difference in the internal arrangement of the vessels of the two countries.

Polarfront I commenced duty at Station MIKE in June, 1948, and the station has been manned by the two ships alternately ever since.

The joint operation of this station by these three countries has been carried out on strictly business lines, almost in the manner of an international company—the British Government acting in the first instance as the ship-builder, supplier of stores and general agent, and the Norwegian Government, after the ships had been turned over to them, as the operating agent for the other two countries. Most consultation between the responsible authorities was made by correspondence, but meetings were held to discuss important problems—in London three times, Stockholm once and Bergen twice.

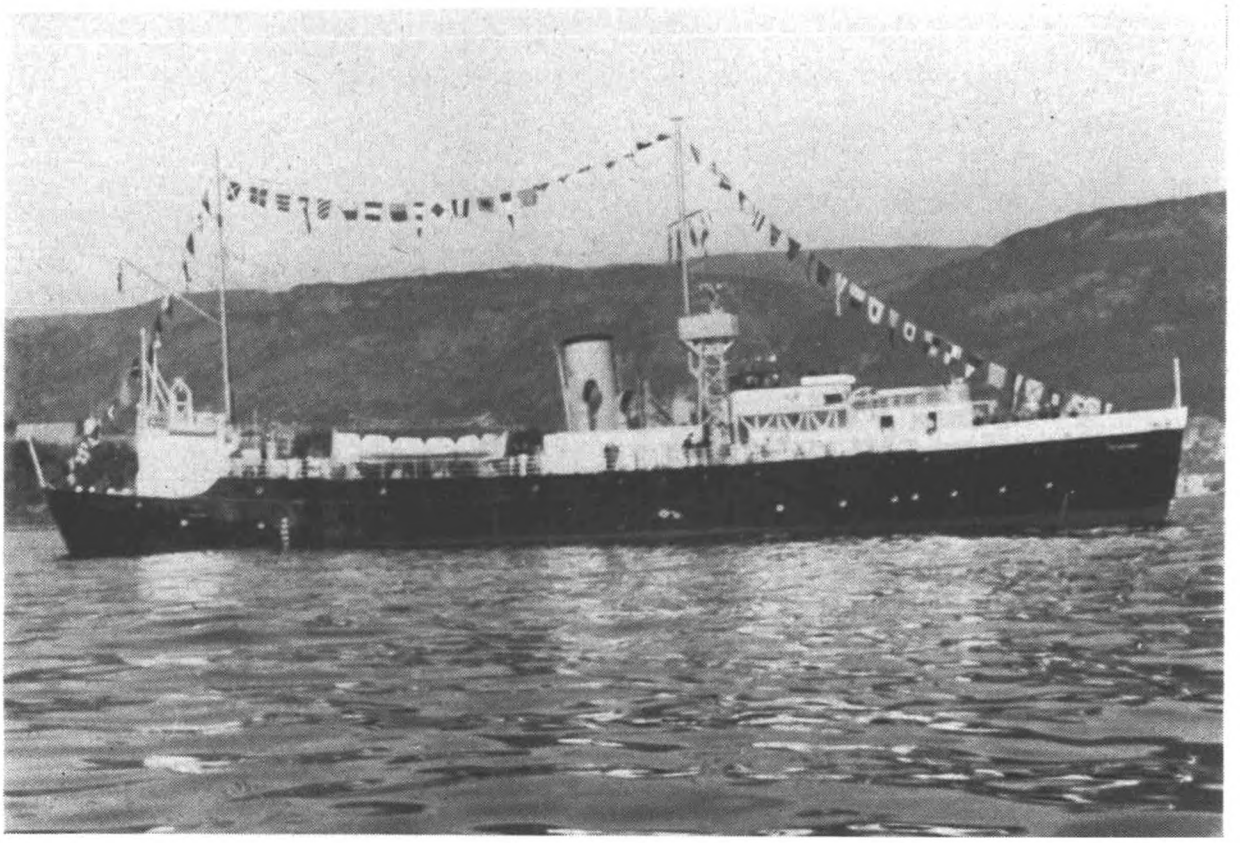
At the second Atlantic Weather Ship Conference in London in 1949, the total number of Ocean Weather Ships in the North Atlantic was reduced from 13 to 10, and consequently some readjustment in the operating responsibility for certain existing stations took place. As a result it was agreed that the United Kingdom would be released from any further responsibility for Station MIKE, and that Belgium and Denmark should take over the British commitment, the Norwegian and Swedish responsibility remaining as before.

At Bergen on 23rd August, 1950, the Anglo/Scandinavian Committee held its final meeting and the Belgian/Danish/Norwegian/Swedish Committee took over. The meetings took place aboard *Polarfront I*, which looked extremely smart for the occasion with her black hull, white upperworks and yellow funnel. The ship was "dressed" overall, the national ensigns of Belgium, Denmark, Norway, Sweden and the United Kingdom being prominently displayed.

To combine business with pleasure, the ship took the visitors for a delightful cruise through the fjords adjoining Bergen—giving them opportunity of admiring some of the charming and characteristic Norwegian scenery. It was fortunate that on this meteorological occasion the weather was kind and the sun shone brightly.

An inspection of the ship revealed her spotless condition and evidence, as one would expect aboard a Norwegian ship, of the efficient manner in which she is operated. The general atmosphere aboard was admirable, and there was no doubt of the enthusiasm of the master and the ship's company for

their job. The master described them as "just one happy family". A typical Scandinavian feature was the two women assistant stewards of the ship, and their presence aboard was shown in the immaculate cleanliness and homely atmosphere of the wardroom. The guests were refreshed with an enormous variety of those tasty sandwiches beloved by all Scandinavians.

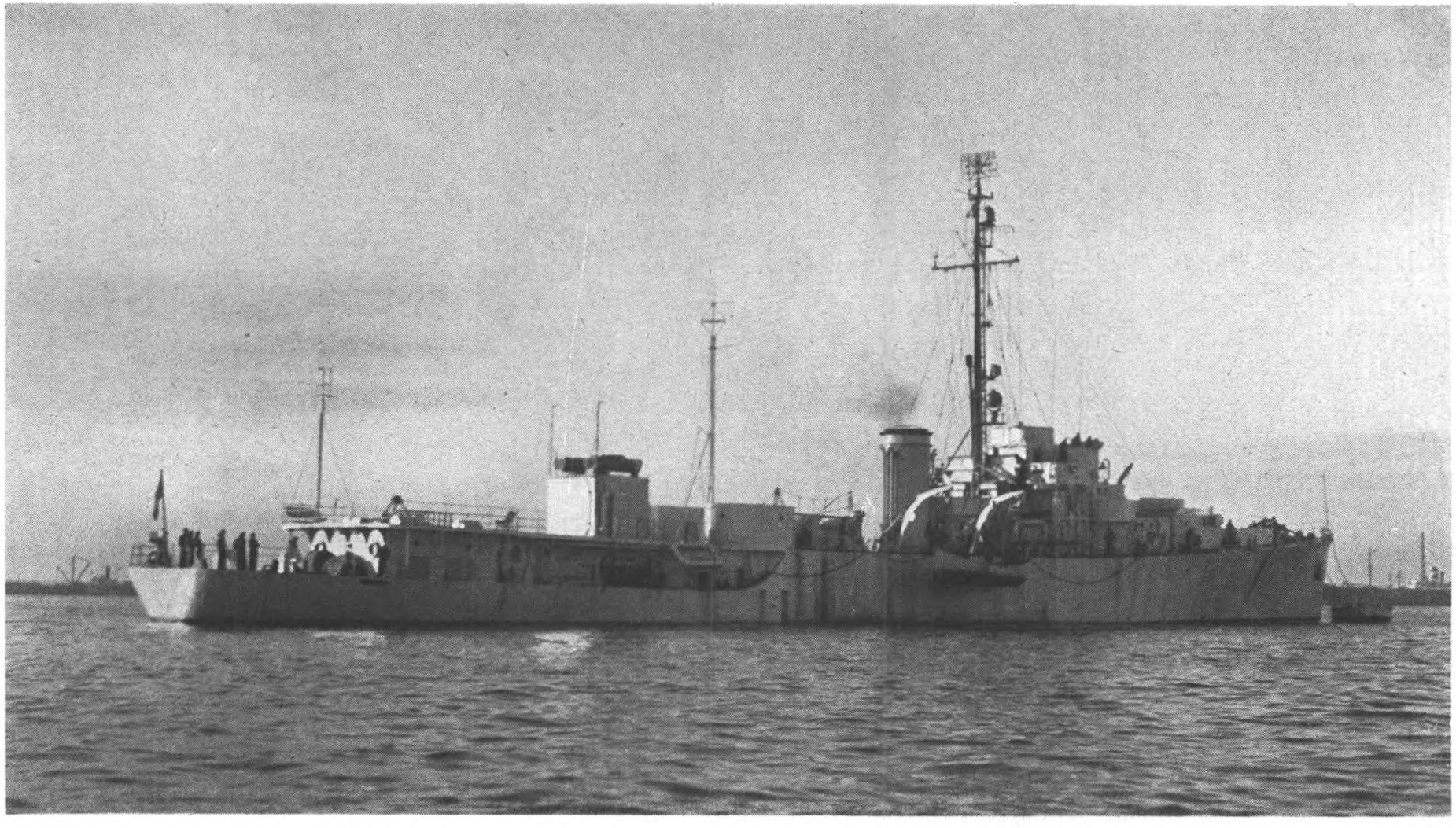


O.W.S. *Polarfront I* at Bergen, 23rd August, 1950

The meteorological equipment aboard *Polarfront I* is similar to that in the British ships, and it is interesting to note that the Weather Ships of both countries are making experimental rainfall observations. The visitors saw a very successful radio-sonde ascent made, during which it was noted that similar technique is employed as in the British vessels. A comprehensive oceanographical programme is also carried out aboard, and the officers seem very interested in this, which is obviously of considerable importance in Norway in view of her valuable fishing industry.

The Norwegian Government entertained the visitors to a dinner ashore at Bergen that night, at which tribute was paid to the very cordial and indeed friendly relations which have marked the association between the Scandinavian and British authorities throughout their joint operation of Station MIKE. The very existence of the North Atlantic chain of Weather Ships is in itself a fine international achievement, but this joint operation of the vessels at Station MIKE by more than one country is surely quite an exceptional example of effective international fellowship. It is to be hoped, and confidently expected, that similar success will mark the future operation of this station by the new partners.

C. E. N. F.



French O.W.S. *Laplace*

Loss of the French O.W.S. Laplace

We are very sorry to record the tragic loss of the French Ocean Weather Ship *Laplace*, which was blown up while at anchor in the Baie de la Fresnaie, near St. Malo, during the night of Friday, 15th September, 1950. As a result of this explosion, which is believed to have been due to a magnetic mine, 22 men were killed or drowned, 29 are missing and 41 are known to have been rescued. The Captain of the *Laplace* was among the missing. Readers of *The Marine Observer* will no doubt wish to join us in expressing our sympathy with the relatives of those who lost their lives.

The *Laplace* was a frigate of about 2,000 tons displacement and about 300 ft. in length, operated by the French Navy as an Ocean Weather Ship in the North Atlantic, having been bought from the United States and specially fitted up in France for this work. Two other French ships of a similar type engaged on this duty are the *Mermoz* and *Le Brix*. The *Laplace* was one of a unique international fleet of vessels engaged upon humanitarian and scientific work of considerable importance to all the countries bordering the North Atlantic. Her loss in peace-time due to a relic of war-time, besides involving French lives and French property, is a loss to international science.

The *Laplace* had only recently completed a period of 21 days' duty at Station KING, situated at position 45°N., 16°W. (in the Bay of Biscay). She was relieved at that station by the *Mermoz* on 13th September. She had returned to Brest and was on her way to St. Malo to represent the French Navy at the opening of new harbour works. Being delayed by bad weather, her captain decided to anchor in the Bay until daylight, rather than risk entering the harbour during dark hours. The disaster occurred about midnight when most of her crew were asleep, and the vessel sank within five minutes. These facts probably account for the large loss of life.

As an epitaph to an Ocean Weather Ship, it is not perhaps unfitting to record her last coded synoptic message :

SHIP K (FMMK) 140005/Z =
SYNOP SHIP =
50452 15100 22822 97020 12616 22400 15300 05311 12945 =
C. E. N. F.

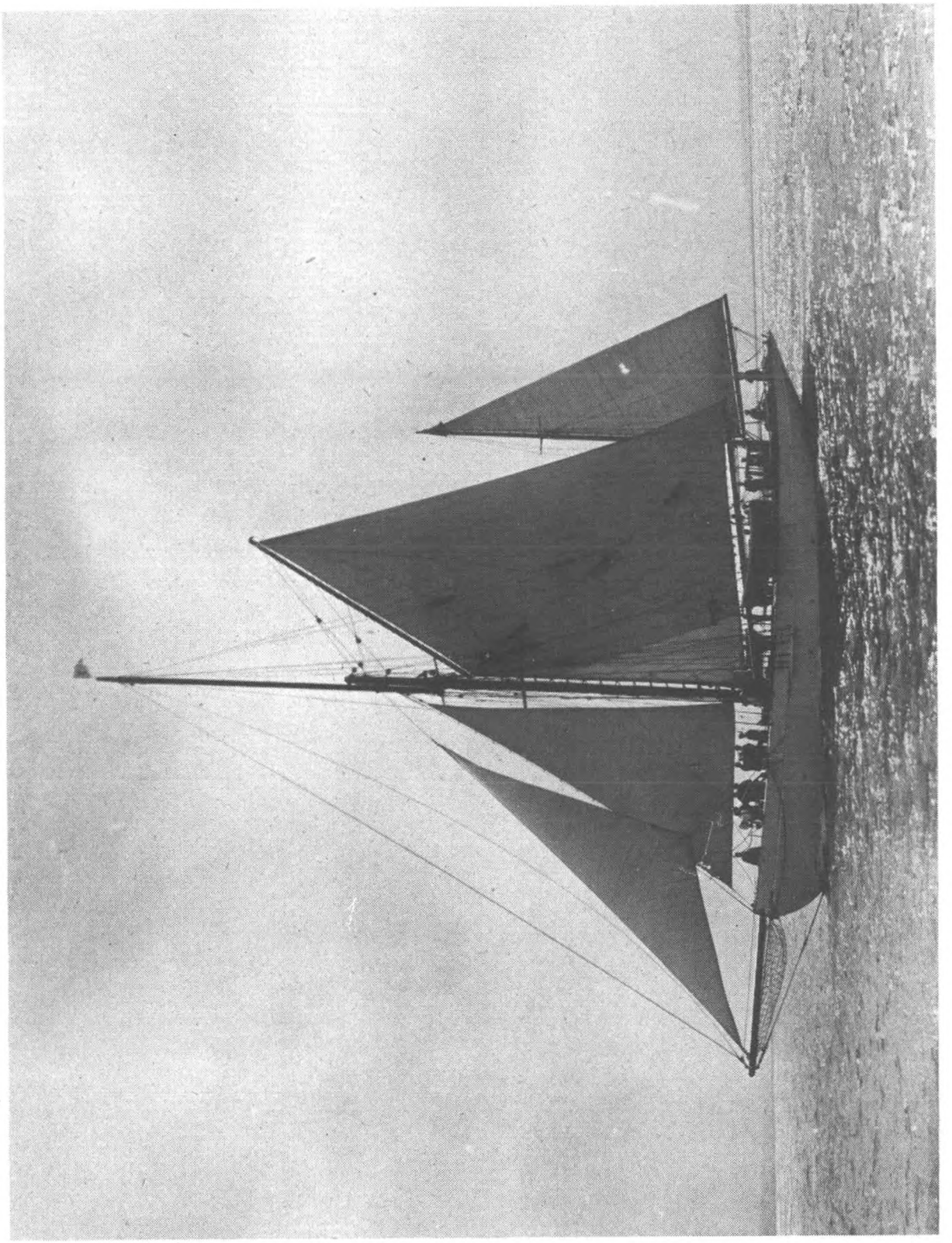
THE " JOHN BISCOE "

The Falkland Islands Dependencies survey and supply ship *John Biscoe*, sailed from Southampton on 19th October, 1950, for a nine-months' voyage to the Antarctic. It will be remembered that the *John Biscoe*, during her previous voyage, was instrumental in saving the scientists who had been marooned on Stonington Island for two winters, and whose relief was much overdue. She arrived in England in July this year, and has had an extensive refit in the meantime. Captain William Johnston, Master Mariner, is in command this voyage, in succession to Commander Kirkwood, R.N.

The *John Biscoe* has again been recruited as a Selected Ship, and it is hoped that during her stay in the Antarctic she will be able to send radio weather messages to the Anglo-Scandinavian Expedition in Queen Maud Land.

THE TRAINING VESSELS OF THE UNIVERSITY COLLEGE, SOUTHAMPTON

Thanks largely to the energy and enthusiasm of their Director, Captain G. W. Wakeford, the School of Navigation at the University College, Southampton, has two small training vessels attached, in which students at the school are able to do short voyages round the coast and, indeed, over to the Continent.



Training vessel *Moyana* of the University College, Southampton

We have heard much, from time to time, about the value of sail training for Merchant Navy officers. The training ships *Worcester* and *Conway* have, to some extent, tried to keep up the tradition by keeping a floating establishment in the form of a sailing vessel, even though she is not fitted with sails. There is little doubt that sail training does sharpen the wits and makes a boy more self-reliant and more used to handling ropes and cordage, and teaches him more true seamanship in a relatively short time than he can learn aboard a steam vessel.

In acquiring the *Moyana* in 1943, however, Captain Wakeford's main object was character training. He believes that a fast, lively sailing vessel helps to produce those qualities of character which make a good citizen and a good ship's officer. Training aboard such a vessel develops integrity, a sense of responsibility, alertness, initiative, resource, self-reliance and the power of decisive action.

The *Moyana's* dimensions are as follows :

Length	95·5 ft.
Length (including bowsprit) ..	113 ft.
Breadth	17·5 ft.
Draught	11·9 ft.
Tonnage	103 (Thames measurement)
Height to main truck	100 ft.
Sail area	3,800 sq. ft.

She was built in 1899 by S. White of Cowes, for the Earl of Dunraven, and we understand has made at least two voyages round the world. She has attained a speed of 11 knots under sail only. She carries a master, two officers, three petty officers and either 13 or 14 cadets.

In addition to the *Moyana*, the University College now has at its disposal the instrument instructional vessel *South Hill.* She is an ex-Admiralty steam harbour launch, whose particulars are as follows :

Length	52·5 ft.
Breadth	13 ft.
Draught	5 ft.
Speed	11 knots
Engines	100 h.p. Grays 2-stroke Diesel

All the conversion work for her present purpose, including the installation of a diesel engine and the launching, was carried out by school staff and cadets.

Although the cadets will receive some instruction on board her, she is to be mainly used for giving instruction in the use of modern navigational aids to officers studying for their certificates of competency, and to give practical instruction in the use of radar afloat to officers taking the Radar Observer Course.

During the summer of 1950, both the *Moyana* and the *South Hill* did a voyage from Southampton to London, via Boulogne. They berthed in the London Docks, and the writer had the pleasure of visiting them at the invitation of Captain Wakeford.

The *Moyana* is ketch-rigged, and is a very attractive vessel to look at with her lofty spars and very well maintained rigging. There was no opportunity

of seeing her stretch of canvas while she was lying alongside. All the work aboard seems to be done by the cadets, and one could not help feeling impressed with the general air of cleanliness and efficiency and, indeed, of happiness on board.

The *South Hill* has a very comprehensive collection of modern equipment aboard, including the following :

British Nylon Ropes
Cossor Radar
Decca Navigator
Heath Magnetic Compass
Improved Submerged Log (Chernikeeff Electric Log)
Kent Clear View Screen
Marconi VHF R/T, TV 5 R/T, Echo Sounder, Lodestone W/T DF
Sperry Gyro Compass.

Photo by Southern Newspapers, Ltd.

Training vessel *South Hill* of the University College, Southampton

This admirable combination of sail training in the *Moyana*—relic of a rather glorious past, symbolising the art of seamanship—and modern scientific navigation in the *South Hill*, certainly provides an excellent background for the training of embryo ships' officers. The two ships together emphasise that the modern ship's officer needs, first and foremost, to be a seaman in order to use intelligently and efficiently the modern apparatus which science provides for him.

As was disclosed at a recent meeting of the Association of Navigation Schools, it is in practical seamanship, boat handling, etc., that candidates for masters' and mates' examinations are lacking, rather than in navigation and other written subjects. As one watched the boys aboard *Moyana*, working on deck under the watchful eye of the bo'sun, one felt they were having the right sort of instruction to make them true craftsmen.

Aboard a sailing vessel, even when fitted with auxiliary power, the wind and the weather need to be watched with care, the weather forecast assumes a new importance—and many are the traps for the unwary who doesn't keep his weather eye lifted and who isn't self-reliant and quick-witted.

Arrangements have been made to supply both these vessels with meteorological instruments on loan, together with the necessary log books as are supplied to British Selected Ships, so that the boys can more readily appreciate, in a practical and theoretical manner, the importance of a seaman being weather-minded.

C. E. N. F.

THE INSTITUTE OF NAVIGATION

At the Annual General Meeting of the Institute of Navigation, held at the Royal Geographical Society on 20th October, 1950, Sir Robert Watson-Watt was re-elected President and the Council for the year 1951 was elected as follows :

Air Commodore C. E. Chilton
Captain G. C. Saul
Mr. F. G. G. Carr (Curator of the National Maritime Museum)
Mr. R. F. Hansford
Mr. L. P. Kirwan
Dr. E. Adams
Mr. E. L. T. Barton
Air Chief Marshal Sir Frederick Bowhill
Mr. Francis Chichester
Cdr. C. E. N. Frankcom
Mr. A. H. Jessell
Cdr. W. E. May, R.N.
Mr. D. H. Sadler
Sir Harold Spencer Jones (Astronomer Royal)
Captain G. W. Wakeford
Captain F. J. Wylie, R.N. (Retd.).

The report of the Council for last year showed that the membership has increased to about 1,100 compared with a total of about 950 in June, 1949. Among the 24 Fellows elected this year are included Admiral Day, who recently succeeded Admiral Wyatt as Hydrographer of the Navy, Lt.-Cdr. MacMillan, R.N.R., Hydrographic Surveyor at Southampton, Captain A. R. Martin, Marine Superintendent of the Port Line, and Commodore Owen, R.N.R., an Elder Brother of Trinity House.

The Master Mariners who were previously elected Fellows of the Institute include Captain G. Wakeford, of the School of Navigation, University College, Southampton ; Captain G. C. Saul, of the Sperry Gyroscope Co. ;

Captain J. H. Quick, Principal Examiner of Masters and Mates; Captain W. Hamilton, late of the L.C.C. School of Navigation; and Mr. S. M. Burton, the author of *Burton's Navigation Tables*.

There is now a total of 54 Fellows of the Institute, all of whom have been elected to this honour on the merit of the contribution they have made toward the science and practice of navigation.

The activities of the Institute during the past year have included the exhibition " Navigation through the Ages ", which was held in London and also—in co-operation with the British Council—in Oslo. Subjects discussed at meetings of the Institute have included " Radar and Charts ", " Lessons from some Collisions and Groundings at Sea ", " Navigation Systems and Instrument Aids ", " Navigation and Strategy in Ocean Racing ", and a symposium of papers on " Marine Radio Position Fixing Systems ".

Among the work undertaken by the technical committees of the Institute has been the preparation of a textbook on the operational use of marine radar, which will be published next spring. During 1951 the Institute will be arranging, in co-operation with the Royal Geographical Society, an exhibition of charting and map-making.

The Council have decided to offer annually an award for the outstanding contribution to navigation or the outstanding navigational achievement of the year, and an award for the best paper to be published during the year in the Institute's journal. Candidates for the former award may be nominated by a member of the Council or by any Fellow of the Institute.

Sir Robert Watson-Watt, in his presidential address, spoke of the relationship between navigation and the aircraft industry. He illustrated the vital necessity, particularly with jet aircraft, of efficient and foolproof navigational aids, and of adequate and accurate meteorological information, and pointed out that navigational aids had not kept pace with modern developments of aircraft design nor indeed with the increase in volume of civil aircraft now in operation.

Thanks to the courtesy of the Honourable Company of Master Mariners, the Institute held a reception aboard the *Wellington* in the evening, at which the Prime Minister, the Rt. Hon. C. R. Attlee, was the guest of honour. Sir Robert Watson-Watt, in his address of welcome, said how honoured the Institute felt at having the Prime Minister as their guest. The Prime Minister, in an informal reply, stressed the debt that Britain owed to her navigators—seamen and airmen—who had done so much to develop our world trade and our Empire, and who had contributed so much toward this country's eminent position in the world of shipping and of aeronautics. Although professing ignorance of navigation by sea or air, he explained that he was himself, nevertheless, a navigator of the ship of State which had, perforce, to steam through many stormy seas, both in the international field and in home waters.

C. E. N. F.

BOOKS RECEIVED

The Ventilation and Heating of Ships. By F. L. Bullen. 8vo. $8\frac{3}{4}$ in. $\times$ $5\frac{1}{2}$ in. pp. 175. *Illus.* Charles Birchall & Sons, Ltd. Third Edition, 1950.

In producing the third edition of this interesting book on the somewhat complicated and, it is regretted to say, sometimes rather neglected subject of ship ventilation, Mr. Bullen has undoubtedly done a service to all those

concerned in the operation of merchant shipping. A comprehensive treatment of this subject is of particular value, at present, when the shipping industry is so much engaged in the export drive and in earning dollars for this country. Homeward cargoes are, of course, equally important to outward ones, for they are often paid for in dollars. In view of the economic, social and political difficulties which confront not only this country but the whole world at this time, there is no doubt whatever that every effort should be made to ensure that cargo out-turns, both outward and homeward, are good, that passengers have comfort and, indeed, luxury, and that crews live in comfortable and healthy surroundings. This is particularly important for British shipping if we are to maintain our lead as a maritime nation. Efficient ventilation plays a great part in all these problems, and this book shows various means whereby this can be accomplished.

The Ventilation of Ships is divided into 13 chapters : The Properties of Air, Ventilation Requirements, Methods of Ventilation, Ventilator Heads, Fans, Air Trunks, Cargo Spaces, Machinery Spaces, Crew's Quarters, Passenger Accommodation, Heating Passenger and Crew Accommodation, Air Conditioning, Testing Ventilation Systems.

The meteorological aspect of the ventilation problem, and the effect of various conditions of humidity and temperature upon the human body, as well as upon various types of cargo, are dealt with in a clear and concise way, and illustrated with various graphs and tables—in a summarised manner in the first two chapters, and in more detail under the appropriate headings elsewhere. The complication raised by the varying moisture content of different commodities is also dealt with. A study of these chapters should assist a ship's officer, given a hygrometer and some knowledge of meteorology appropriate to a first mate, and a normal ration of commonsense, to do quite a lot to lessen the risk of sweat and other moisture damage to his cargo by intelligently controlling his ventilation. This is without the use of any drying agent, or any artificial means. It is a pity that the author did not expand a little more on this subject ; it is worthy of a chapter all to itself. Instead, in Chapter VII, he goes on to recommend the installation of drying agents—which is probably an excellent idea in new construction but is undoubtedly expensive.

On reading the book, when coming to Chapter IV, one wonders how best to reconcile type of ventilator head with " controlled " ventilation. The cowl type, which still seems to be beloved by the shipping industry, requires frequent trimming, and covering it up is almost a major operation, whereas the " water excluding " ventilators of an efficient type, although they don't need trimming, seem to afford no efficient means of closing them if the master wishes to control the ventilation. It seems that a new design of ventilator might perhaps serve a useful purpose.

Mechanical ventilation of cargo spaces and refrigeration (including rapid freezing) are discussed in a clear and readable manner and are liberally illustrated with tables and drawings. Passenger accommodation, crew spaces and machinery spaces are all dealt with interestingly and adequately, and a perusal of these chapters brings home to the reader the intricacy of the problem of efficiently ventilating a modern ship.

At the end of the book there is a brief Appendix giving some useful definitions and tables.

There are a few criticisms. On page 1 the author says, " The temperature at which super saturation occurs is known as the dew point . . . ". The word " super " should surely be deleted from this sentence. Also on page 1, the statement that " the relative quantity of moisture in the air constitutes its humidity " should read " the relative quantity . . . constitutes its *relative* humidity ". Percentages of humidity given on this page should also more correctly be expressed as percentages of relative humidity—thus, 50 per cent relative humidity. On page 150 the titles of the two drawings have been transposed in error. On page 157 the rather lengthy definition of humidity absolute might have been simplified by saying that it is " weight of water vapour per unit volume ". On page 158, under the definition of " Calorie ", " one gram " should be substituted for " one kilogram ". The example on page 159 of how to use Table A seems to be a bit complicated, and one wonders why the author did not merely refer to Table B (Humidity Table) to find the dew point and relative humidity.

Altogether this should be a handy book of reference for ships' officers and others on the operational side of shipping. C. E. N. F.

APPOINTMENT OF PORT METEOROLOGICAL OFFICERS

In the April, 1949, number of *The Marine Observer*, mention was made of certain new appointments of Port Meteorological Officers which had been made in United Kingdom ports. Captain Radley was appointed to Southampton, Captain Reid to Glasgow, and Mr. Milburn as additional Nautical Officer at Harrow. In July, 1949, Mr. Milburn resigned his appointment in order to take up a position as Nautical Surveyor and Examiner of Masters and Mates in Hong Kong. During his relatively short term of service at Harrow, Mr. Milburn showed considerable ability and was an agreeable colleague with whom to work, and we were sorry to see him go.

In August, 1949, Mr. J. C. Matheson, Master Mariner, was appointed Port Meteorological Officer at Cardiff. Mr. Matheson first went to sea in 1931, and after serving his apprenticeship in the Donaldson Line joined the Clan Line, where he rose to the rank of Chief Officer. He served in ships of the Clan Line throughout the war and his last ship was the *Clan MacNeil*, which he left immediately prior to taking up this shore appointment. He served in several Selected Ships during his period at sea.

Captain Reid, who was first of all temporarily appointed to Cardiff (in March, 1949) owing to lack of office accommodation in Glasgow, was transferred to Harrow when Mr. Milburn resigned, and eventually took up his appointment at Glasgow in November, 1950.

Captain Reid thus takes over at Glasgow the duty formerly carried out by Captain W. W. Elliott, who has been Merchant Navy Agent in that port since 1st July, 1946. Captain Elliott has done a fine job during his term of office in recruiting voluntary observing officers for meteorological work at sea aboard Selected Ships, in equipping the ships and in maintaining the interest of the officers in this work. It was decided a long time ago that the size and importance of Glasgow as a port, combined with the increasing importance of meteorological reports from ships at sea, made it necessary to have a full-time Port Meteorological Officer in that port. Captain Elliott's appointment as Merchant Navy Agent was therefore only temporary, pending the appointment of a Port Meteorological Officer.

On behalf of our Director we thank Captain Elliott for the good work that he has done, and we feel sure that the many friends he has made among the masters and officers of ships trading to Glasgow will join us in wishing him health and happiness in the future.

Lieut.-Commander L. B. Philpott, D.S.C., R.N.R., took up an appointment as a Nautical Officer at Harrow in October, 1950. Mr. Philpott served his apprenticeship in the Port Line, and was in the service of that company from 1925 until 1939, attaining the rank of second officer. While in the Port Line he served in many Selected Ships. He served in the Royal Navy from 1939 to 1946 and was in command of convoy escort vessels in the North Atlantic for about three-and-a-half years. He was awarded the D.S.C. and was three times mentioned in despatches. He has recently been in charge of Admiralty civilian-manned vessels at Plymouth.

Largely as a result of the Empire Meteorological Conference (London, 1946), Port Meteorological Officers have for a long time been established at certain ports in the British Commonwealth, outside of Great Britain, and such officers have now been appointed in Australia, Bermuda, British East and West Africa, Canada, Fiji, Hong Kong, India, Malaya, New Zealand and South Africa. The names and addresses of these officers appear on pages xxvi and xxvii in part II of this number.

At the Conference of Directors of the International Meteorological Organisation in Washington in 1947, the following resolution was passed :

> The Conference recommends that the Meteorological Services of maritime States should, if practicable, appoint meteorological liaison officers with marine experience for duty at their major ports :
>
> (*a*) For recruiting, instructing and maintaining contact with voluntary observers on board ships of the State concerned.
>
> (*b*) So that assistance may also be available, on request, by the ship concerned, to the ships of all countries, with respect to :
>
> (i) servicing of instruments ;
>
> (ii) information regarding storm warnings, forecast messages, etc. ;
>
> (iii) any other difficulties which may arise.
>
> Bearing in mind the provisions of Resolution CD Copenhagen 1929 : 33, the Conference considers, however, that there would be no objection to these liaison officers offering their services to ships (other than selected or supplementary ones), or using their discretion, under special circumstances, in seeking the co-operation of such ships for furnishing weather reports in abbreviated code, subject to the approval of the owners or local agents. In all cases the permission of the master of the ship should be obtained.

As a result of this resolution, Port Meteorological Officers have now been established at the ports of the following countries outside of the British Commonwealth.

AFRICA : Canary Islands, Cape Verde Islands, Egypt, French North Africa, French Somaliland, French West Africa, Madagascar, Madeira, Mauritius, Portuguese East Africa, Reunion.

ASIA : Indo-China, Israel, Japan, Lebanon, Philippines, Thailand.

AMERICA : Alaska, Argentina, Brazil, French Antilles, Mexico, Puerto Rico, Uruguay, U.S.A.

EUROPE : Azores, Denmark, Finland, France, Germany, Iceland, Italy, Netherlands, Norway, Portugal, Rumania, Spain, Sweden, Yugoslavia.

PACIFIC OCEAN : French Oceania (Papeete), Hawaii.

WATER MOVEMENTS AT THE NORTH GOODWIN LIGHT VESSEL*

BY J. N. CARRUTHERS, A. L. LAWFORD AND V. F. C. VELEY

Dr. J. N. Carruthers, D.Sc., F.Inst.P., and Cdr. A. L. Lawford, R.N. (retd.), are members of the Royal Naval Scientific Service. Instructor-Lieutenant V. F. C. Veley, B.A., R.N., is serving with the authors in the Hydrographic Department of the Admiralty.

Editor's Note. In view of the known variability of water movements—be they due to tide or to current—in the North Sea and the great influence the wind has upon them, it would seem that this paper is well worth studying by mariners. The Goodwin Sands are notoriously dangerous, due to the above causes, the extent of the sands and the liability to low visibility in its vicinity. The number of vessels which have come to grief on the Goodwins is evidence of this.

Introduction

There is an ever-increasing interest in the subject of wind influence on water movements in the sea. It is far from being the case that it is only the practical seaman who shares this interest with the scientist, but it has to be remembered that this journal is primarily for seamen. Theorising will therefore be kept to a minimum and as plain a story as possible will be told concerning the observations with which this report will deal.

In two earlier papers, published in this journal in January and July, 1939, one of us discussed certain observations on water and wind movements past a number of lightships stationed in the southern North Sea and eastern English Channel. These observations revealed the very marked degree to which water movements are affected by wind.

When, in February, 1939, the Norfolk coast was seriously breached by the sea at the time of the Horsey floods, the horizontal water movements associated with the high-water levels (occasioned by the strong NW'ly winds) were so pronouncedly different from usual as to warrant the publication of a special paper on the subject.[1]† In this paper it was recorded that, at the position of the Sandettie Lightship (18 miles east of Deal and 16 miles north of Calais) the north-east-going travel of the water amounted to a mere 4·9 miles a day in contrast with an average daily run of 13·2 miles, whereas the south-west-going values were 20·3 against an average of 11·6. Thus, at that time of powerful and persistent winds from the NW. quadrant, there was a net (overall) flow of water of 15·4 miles a day directed towards Dover Straits, in contrast with the average situation of 1·6 miles a day north-east-going.

In citing this noteworthy case from available records, which could also provide information of the sort for other positions, we have intentionally used simple descriptive terms to avoid the employment of the words " Tidal Stream ", which now have a rather special meaning in the Admiralty, and we shall continue to do so in what follows. Where (as in the case of the Sandettie Lightship) we speak of north-east-going water travel, we mean what the old-time practical seaman would think of as the two flood streams within the day, or even as the " flood ", or sometimes, perhaps (and less properly), as the " flood tide ".

*This paper (the third of a series of papers entitled " Studies of Water Movements and Winds at various Light Vessels ") is published with the approval of the Lords Commissioners of the Admiralty, but the responsibility for any statement of fact or opinions expressed rests solely with the authors.

†The index numbers refer to the list of references on p. 45.

Over a period of years before World War II there had been a programme of work in progress at quite a number of lightships (not only English), which produced continuous data of the speed and direction of water movement, day in, day out, for months on end without intermission. The observations went on throughout the worst weather of winter and, in total for all places, there are available records for over 8,000 days of observation.

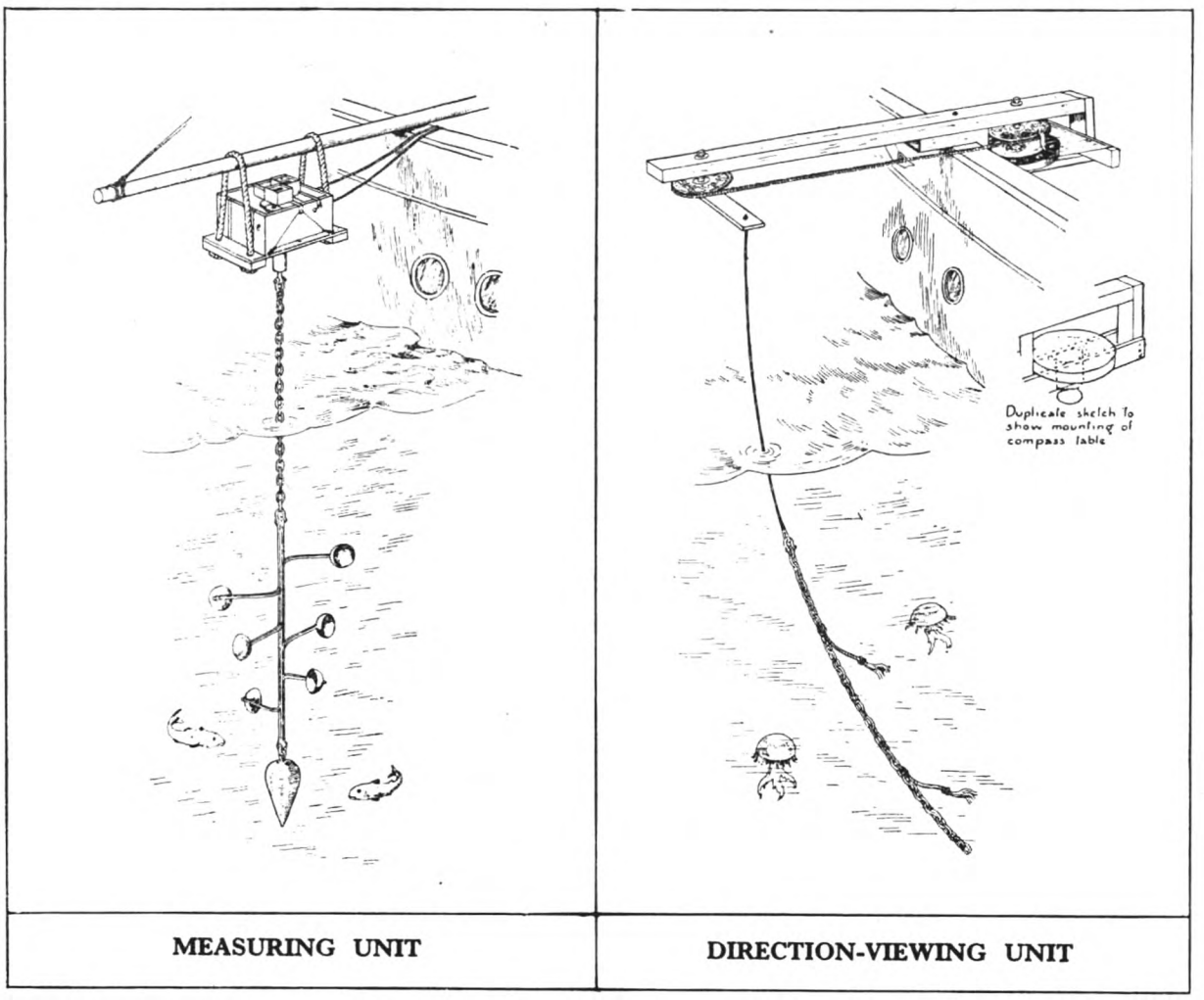


Fig. 1. Vertical Log Current-Meter

The instrument used was the vertical log current-meter. This is a very robust, very simple, in fact quite a humdrum piece of apparatus; full descriptions of it are readily available in print.

The instrument is in two parts: one is a speed-measuring unit which consists of a set of six heavy iron cups suspended vertically in the water; the other is a separate direction-viewing unit, which is fixed on the lightship's rail some little distance from the measuring unit. The cup system is heavy, very strong, and "occupies" about 5 ft. of water in the vertical; the individual cups, 6 in. in diameter, are borne out on arms from a central rod so that their centres are about 15 in. from it. Viewed in plan, the cups are spaced at 60° intervals round the circle. The cup system is suspended from a three-fathom length of chain, and below the bottom cup is hung a heavy pear-shaped plummet. The cup system weighs about 160 lb., and in use it is hung from a vertical spindle which turns in a ball-bearing thrust block carried in the bottom of a stout wooden box. This wooden box is hung by

rope beckets from a horizontal boom projecting outboard from the ship's rail at about the midships position.

Counters are used to record the revolutions of the cup system when it is turned by the moving water. One counter stays in use permanently to record total registrations, and others (one for each octant of the compass) are shipped and unshipped by hand as the water moves this way and that.

The direction-viewing unit is very simple indeed; the direction towards which a light vertical chain, with a terminal weight and several rope " tassels " along its length, is carried by the moving water is communicated inboard to a metal pointer, which turns above the face of a dumb wooden compass. This is kept set by hand to the ship's compass, and since this dumb compass is marked in octants bisected by the eight cardinal and intercardinal directions, it is easy to have the appropriate counters functioning to record how many revolutions are put on within the several octants in the course of a lunar day.

A series of papers has recently been prepared by the authors relating to observations made with the vertical log aboard different lightships; this present one deals with observations made at the North Goodwin Lightship in 1939–40.

It is interesting to notice that the period of the North Goodwin records to be discussed includes the rightly-styled " Miracle of Dunkirk " (26th May to 2nd June, 1940),* and it is for this reason that the extracts from past Sandettie records were made above. It will be seen that during the critical evacuation there were no occasions when the water movements were modified by meteorological conditions to a degree far outside expectation. They did not, therefore, cause trouble to amateur navigators (who already had problems enough) who were faced with the need to round the Goodwins.

Results

Observations commenced aboard the North Goodwin Lightship on 1st December, 1939, and continued until 18th August, 1940, the day before she was abandoned owing to enemy air attack. In all, 252 observations, each lasting one lunar day, were made; only one day (13th August, 1940) was missed.

The position of the lightship during the period under review was 51° 20·3′N., 1° 34·5′E., or roughly six miles to the east of Ramsgate and a mile or two to the northward of the Goodwin Sands (Fig. 2). She lay in a mean depth of nine-and-a-half fathoms.

Water movements at this position occurred in the south-west and north-east octants only, the overall or residual movement being predominantly south-westerly.

The centre of the cup system of the measuring unit was 9 ft. below the sea surface. The water layer in which observations were taken was from one to two fathoms below the surface.

The total revolutions, and the revolutions of the two individual octant counters, per lunar day, were simply obtained by subtracting the readings of the day before. The total daily revolutions and the sum of the revolutions on the two octants agreed to within one or two revolutions, which represent a very small fraction of the whole.

**Marine Observer*, October, 1950, Editorial.

The water movement in sea miles per lunar day was obtained by applying the " calibration constant " of the instrument to the revolutions. In this case 300 revolutions were the equivalent of one mile (6,080 ft.) of passing water.

The wind was estimated every three hours, the strength being recorded in Beaufort scale numbers. When the local tractive effect of the wind is considered in this paper, sight is not lost of the fact that the observations relate to a water layer well below the surface. The mean wind for the day was calculated by geometrically averaging the winds recorded between the times of the initial and final readings of the counters each day.

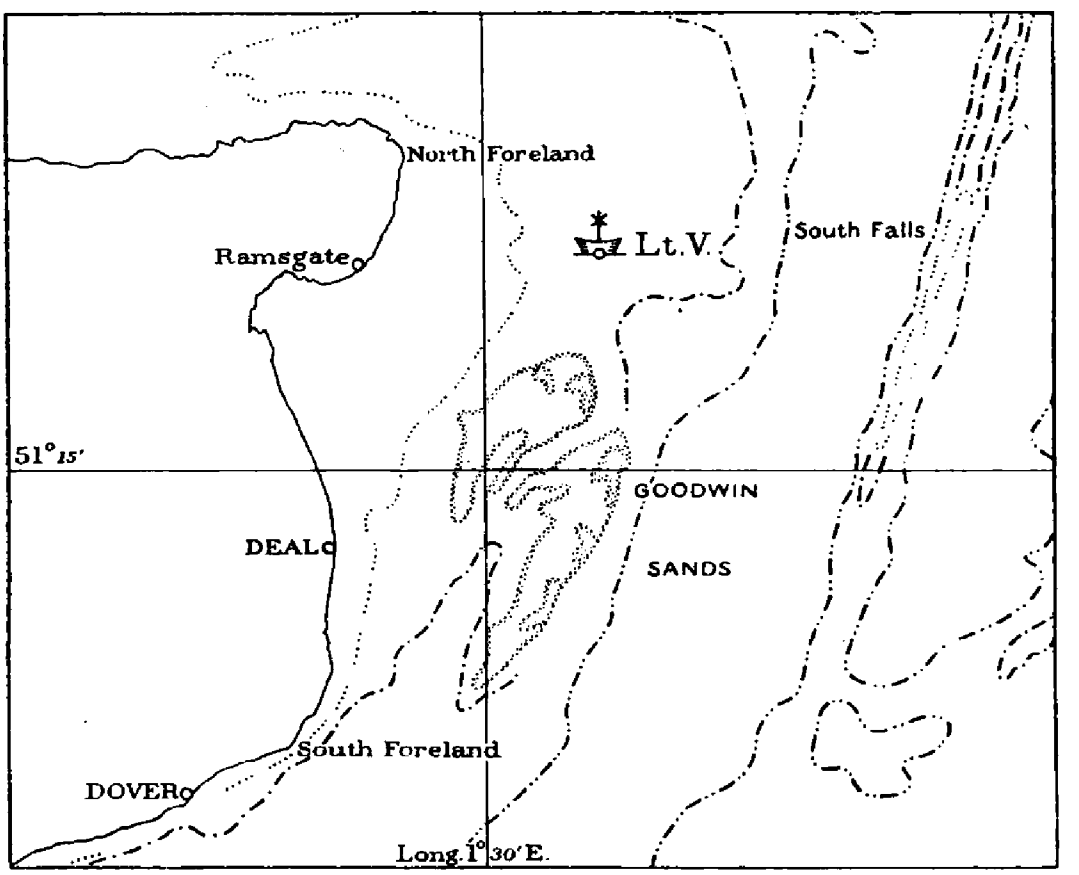


Fig. 2. Position of North Goodwin Light Vessel.

A plot of the total daily water movements (Fig. 3E), i.e. the sum of the water movements on both octants regardless of direction, showed the usual resemblance to a tidal cycle, with maxima occurring about two days after new and full moon.

The plot of the residual daily water movement (shown as a continuous line in Fig. 3F), i.e. the difference between the movements on the two octants, showed very little tendency toward regularity. It is considered that this was due to the marked effect of the local wind and to the very small magnitude of the intrinsic residual water movement.* Comparison of the departures from the mean of the residual water movement plot in winter and in summer months with the accompanying wind strengths (Fig. 3G), will adequately illustrate this point. For example, the marked increase of strength of the residual water movement toward south-west at the beginning of March coincides with a strong north-east wind.

*Intrinsic residual water movement—any current remaining when the tidal influence and the current due to the wind blowing at the time are subtracted.

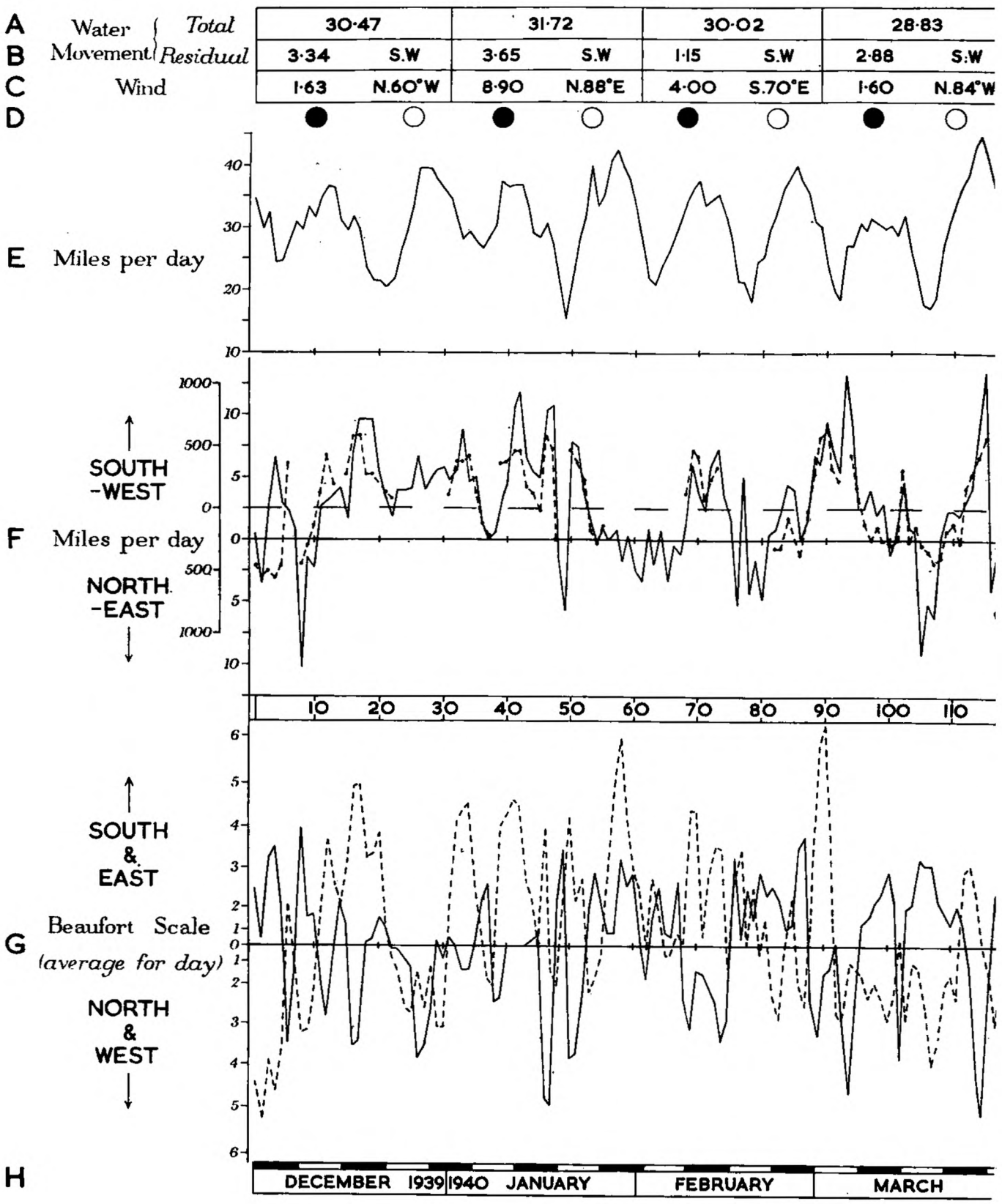
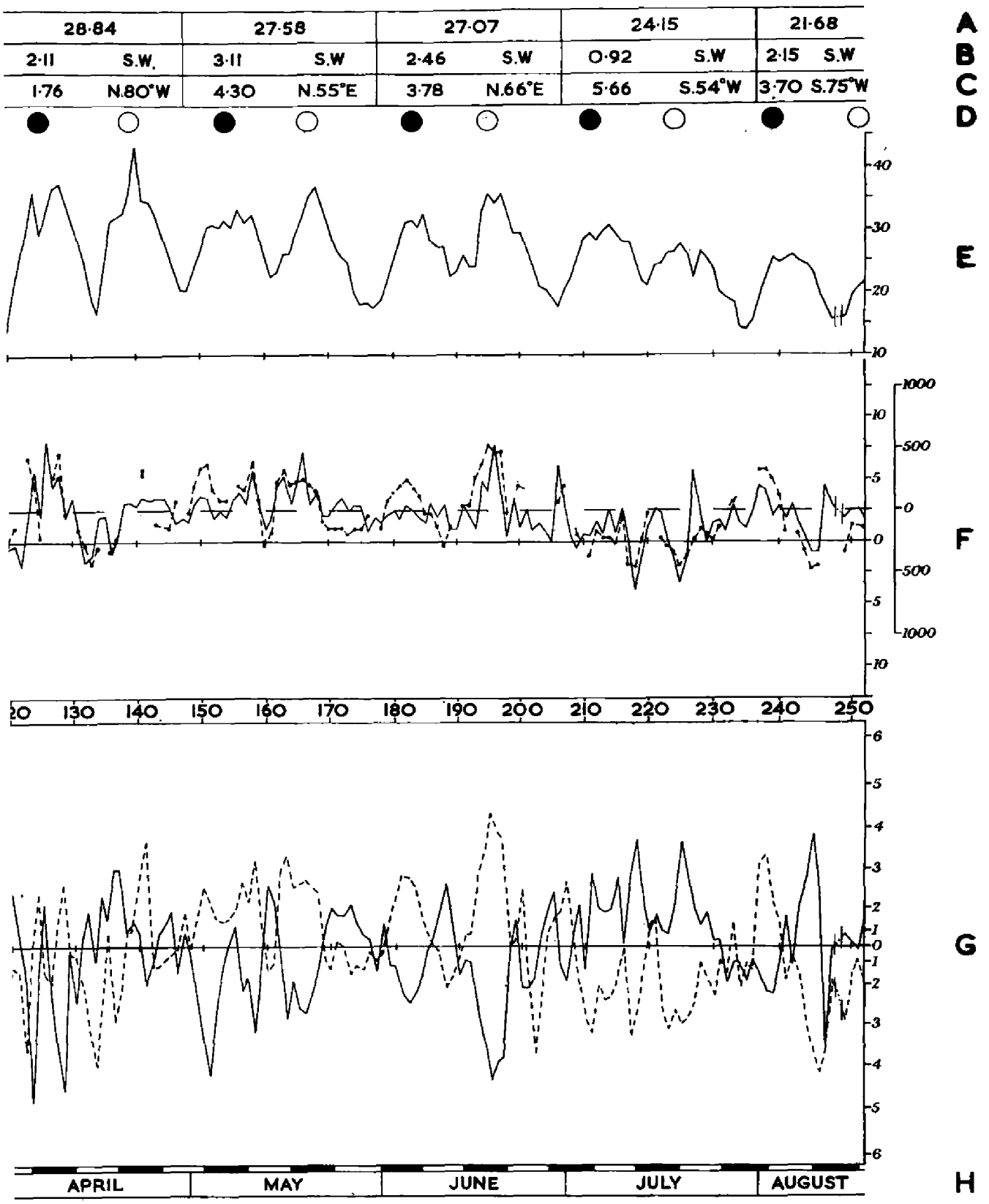


Fig. 3. Water movement and wind at the North

A—Average monthly total water movement (the summed daily mileage, irrespective of direction) in miles per day.
B—Average monthly residual water movement (the net travel or " overall make " of the water) in miles per day and the octant in which it lay.
C—Average monthly residual wind strength, in miles per hour, and direction.
D—Full and new moons.
E—Daily total water movement in miles per day.
F—Continuous line—daily residual water movement, in miles per day. Pecked line—mean daily SW. and NE. wind travel, in miles per day.



Goodwin Light Vessel, December, 1939, to August, 1940.

G—Mean daily residual wind, in Beaufort scale. North and South components are drawn in full line, East and West components in pecked line.

H—Calendar : black and white bars represent weeks of seven solar days.

NOTES

(i) All days are lunar days of 24 hrs. 50 mins., unless otherwise stated.

(ii) All miles are sea miles of 6,080 feet.

(iii) All directions are magnetic (variation $= 10°$W.).

In view of this, it was not considered possible to construct any form of "ideal" curve, such as was done in the case of the Seven Stones Light Vessel near the Scilly Isles,[2] with which to compare the plots in an attempt to analyse the association of the wind with the water movements. Scrutiny of the residual water movement and residual wind plots, however, instantly revealed that almost every "peak" of wind was matched by a similar "peak" of residual water movement in the direction toward which the wind was blowing. As might be expected, this applied only to winds from the south-west and north-east quadrants.

To bring out this association more clearly, a modified south-west and north-east wind plot (pecked line) was superimposed upon the residual water movement plot (Fig. 3F). This was achieved by calculating the resultants of the north-south and east-west wind components and plotting these, with their quadrantal directions reversed, about the average wind for the whole period (24 miles per day towards south-west), which was made to coincide with the average residual water movement (2·5 miles per day towards south-west). In only about 5 per cent of the analysable observations was the residual water movement in opposition to the residual wind; it is assumed that in these cases the intrinsic water movement was sufficiently large to overcome any wind effect. In accordance with the principles of tidal analysis it was assumed that the intrinsic water movement was composed of two waves, one of 28-day period and one of half-yearly period. As regards the latter, it appears from the degree of parallelism between the residual water movement and modified wind plots that the half-yearly wave crosses its mean (the horizontal dashed line of Fig. 3F) in the beginning of January, the end of March and the end of June. Examination of the large north-east peaks in February to March and the general south-west trend in April to May leads one to suppose that maxima in these directions occur at these times. Since the mean of the residual water movement is to the south-west, it is suggested that the mean of the half-yearly wave is also to the south-west, and that it crosses the mean, therefore, in the middle of January, March and June. At those periods the two plots were remarkably similar in shape, and hence, assuming that the residual water movement was entirely due to the wind, it could be calculated what percentage of the wind movement was translated to the water.

Considering observation No. 41 as an example, the residual wind was 450 m.p.d. and the residual water movement 10·5 m.p.d. Thus the water movement was approximately $2\frac{1}{4}$ per cent of the wind travel.

Similar calculations made for observations in the first half of January and the latter half of June, on all occasions when wind strengths were force 3 or above, give an average of 2 per cent. This is in fair agreement with the finding of Thorade[3], which is that:

$$V_w = \frac{1{\cdot}26\ V}{\sqrt{\sin \lambda}}$$

where V_w is the water movement in cm/sec., V the wind velocity in m/sec. and λ the latitude.

Converting to other units and substituting $\lambda = 51°$ (the latitude of the North Goodwin Lightship):

$$V_w \text{ (m.p.d.)} = 0{\cdot}34\ V \text{ (m.p.h.)}$$

or, water movement = $1\frac{1}{2}$ per cent of wind travel.

The ½ per cent discrepancy might be due to a small intrinsic water movement remaining at the times considered.

A further analysis was made by investigating the monthly averages of water and wind movements, shown at the top of Fig. 3 and illustrated graphically in Fig. 4, as these give reasonably smoothed values for comparison over approximately equal periods of time. It was found that the following conditions of water movement occurred in association with the mean residual wind :

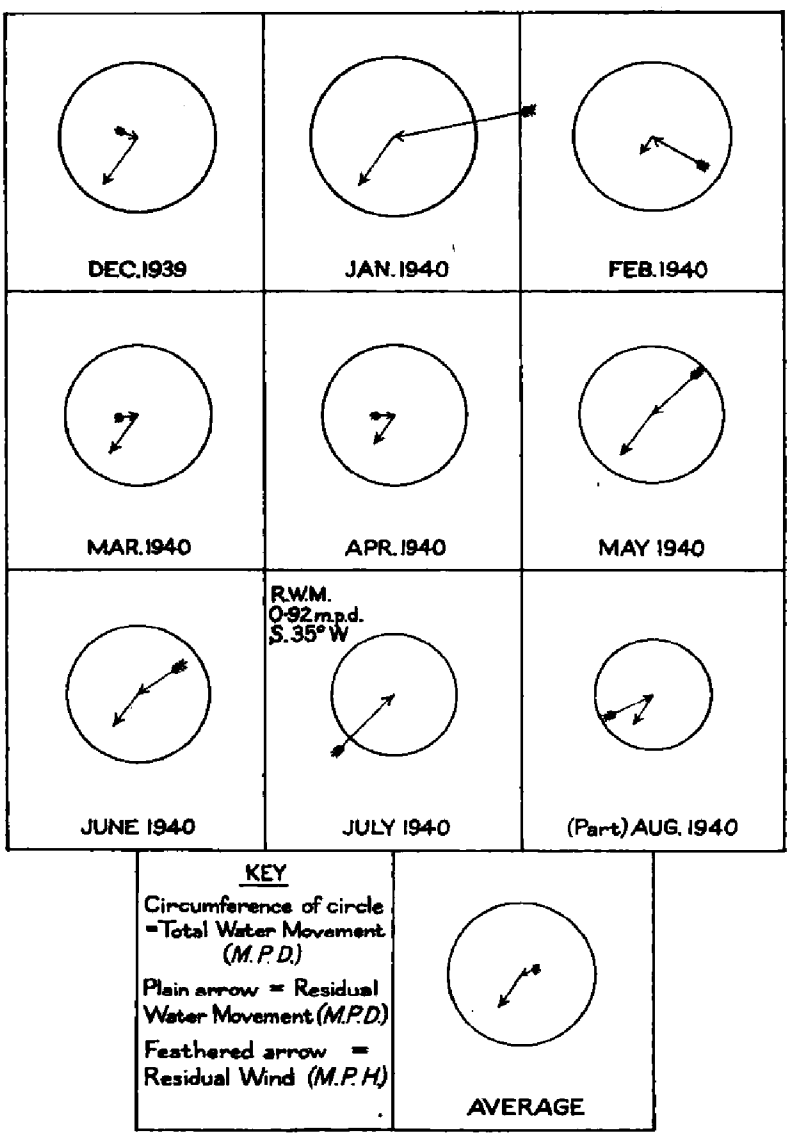


Fig. 4
Monthly average total and residual water movement and residual wind at the North Goodwin Light Vessel. (All directions are true.)

(*a*) Larger *total* water movements than usual were associated with winds from east-north-east, east and west-north-west, and smaller movements than usual with winds from south-west and west-south-west. Winds from north-east and west were associated with average total water movements.

(*b*) Above-average *residual* water movements were associated with north-easterly and north-westerly winds (particularly the former) and below-average movements with south-easterly and south-westerly winds.

These are by no means firm conclusions, since only nine monthly averages were available for analysis, and winds from every octant were not represented. It is therefore preferable to draw the following conclusions from consideration of the residual water movement and modified wind plots discussed earlier :

(i) that north-easterly winds are associated with stronger south-west-going residual water movements, and south-westerly winds with north-east-going or weaker south-west-going water movements, in 19 cases out of 20.

(ii) that the local wind appears to have a dominating and immediate effect upon the residual water movement.

The general residual water movement through the Straits of Dover past the Goodwin Sands is north-north-easterly, while the observed movement at the North Goodwin Lightship is south-westerly. Fig. 5 represents an attempt to reconcile this apparent contradiction, on the assumption that the observed residual water movement is part of a small anticyclonic eddy, centred approximately at the Gull, set up by the interposition of the Goodwin

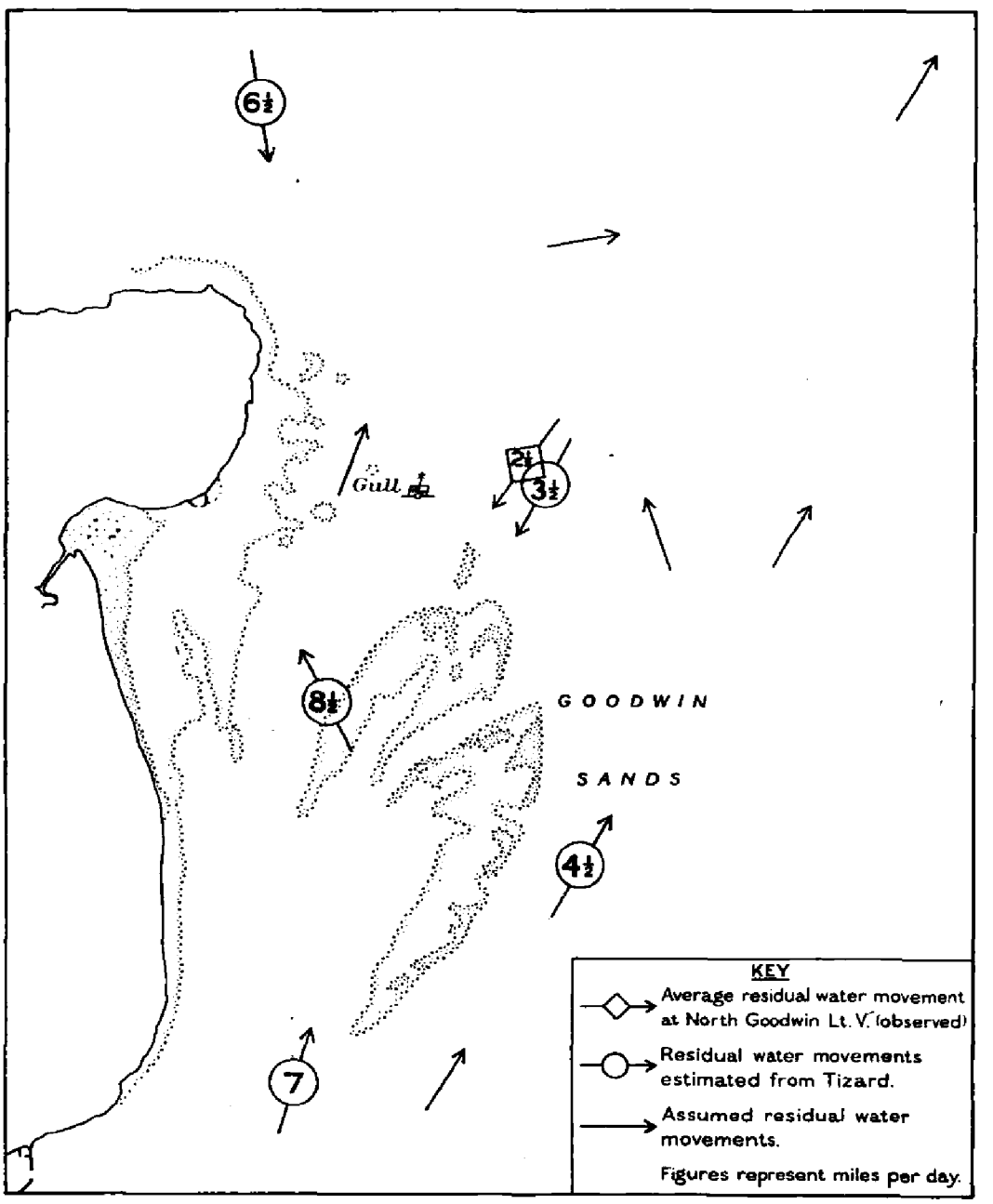


Fig. 5. Possible circulation in the vicinity of the Goodwin Sands.

Sands between the main north-easterly movement and its junction with the east-going flow along the north coast of Kent. The water movements are the resultants of the figures given in his tables by Tizard,[4] assuming that the hourly observations represent the average water movement for an hour.

ACKNOWLEDGEMENT. The authors desire to express their thanks to Lieut.-Commander J. F. Gruning, D.S.C., R.N., for basic computational work; to the crew of the light vessel concerned; and to the English Fisheries Department for allowing the instruments used to remain available after the outbreak of war.

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[2] CARRUTHERS, J. N., *et al*: Studies of Water Movements and Winds at Various Light Vessels; 2. At the Seven Stones Light Vessel near the Scillies (to be published in the *Journal of the Marine Biological Association*).

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Summary

A survey of the water and wind movements recorded during the 252 days of observing at the North Goodwin Lightship brought the following facts of chief interest to light:

(i) Water moved towards the south-west and north-east octants only.

(ii) The maximum/average/minimum values of the total water movement (the summed daily mileage of the travel in both octants) were 44·7/28·1/14·1 miles per day.

(iii) The maximum/average/minimum values of the daily water movements in the individual octants (magnetic) were as follows:

South-west = 27·7/15·3/4·2 miles per day;
North-east = 20·8/12·8/5·7 miles per day.

(iv) The maximum/average/minimum residual current (the net travel or "overall make" of the water) and its direction of flow (magnetic) were 13·5/2·5/0·1 miles per day towards south-west.

(v) The maximum/average/minimum values of the residual water movements in the individual octants (magnetic) and the percentage frequency with which they occurred, were:

South-west = 13·5/3·4/0·1 miles per day, 82·9 per cent;
North-east = 10·5/2·5/0·4 miles per day, 17·1 per cent.

(vi) The maximum/average/minimum residual wind, expressed as resultant for a whole day, and its direction (magnetic) were:

30·4 miles per hour from east;
1·0 mile per hour from east by north;
0·4 mile per hour from west.

(vii) The residual winds in individual octants, expressed as a mean for a whole day, are given in miles per hour in the following table, together with the percentage frequency with which they occurred.

Octant (magnetic)	N.	NE.	E.	SE.	S.	SW.	W.	NW.
Maximum . .	22·5	29·2	30·4	19·6	20·0	27·9	23·4	18·8
Average . .	11·7	13·0	12·7	7·6	6·8	9·6	9·7	7·3
Minimum . .	9·8	2·5	1·7	2·5	1·3	0·8	0·4	1·7
Frequency %	8·3	19·1	13·9	7·9	7·9	26·2	9·9	6·8

THE DENNY-BROWN ANTI-ROLLING STABILISER

The news that the P. & O. liner *Chusan* has been fitted with the Denny-Brown stabiliser, in order to reduce the rolling of the ship at sea, introduces a new feature in carriage of passengers at sea. The readers of this magazine will no doubt know that the inventor of this apparatus recently received an award from the Government for his excellent work in producing such an efficient apparatus for use in H.M. ships.

This stabiliser, which depends for its operation upon a gyro-stabiliser associated with fins, has previously only been used in H.M. ships and cross-Channel steamers.* It is interesting to note that not only can it ease the vessel's rolling, but can also be used to induce rolling in calm weather. During the trials of the *Chusan* the weather happened to be calm, so the vessel was made to roll to no mean extent by means of the stabiliser. If these trials in the *Chusan* are successful, it seems there is little doubt that the possibility of using stabilisers will be introduced in other large passenger liners, and perhaps this will have quite an effect upon the passenger trade, for the terrors of sea-sickness are always present in some people's minds, and probably prevent quite a few would-be passengers from venturing afloat.

The use of anti-rolling devices has little to do with meteorology, except in an indirect way. Meteorologists are interested in waves and wave formation, partly because these are induced and affected by meteorological conditions, but also in the application of knowledge about them to other sciences and to industry. There are many reasons why we should study waves and their generation, movement, dimensions and dissipation, and there is little doubt that the knowledge which has been acquired in the past about waves and the motions of a ship in a seaway have influenced the design and application of the Denny-Brown stabiliser.

*An article on the fitting of the Denny-Brown Ship Stabiliser to S.S. *Isle of Sark* appeared in *The Marine Observer*, October, 1936.

C. E. N. F.

WATERSPOUTS

BY A. H. GORDON, M.S.

(Marine Branch Meteorological Office)

PART I

Introduction

The waterspout is one of the most striking and fascinating of all meteorological phenomena to observe. It may range from the awe-inspiring sight of a violent tornado, which has travelled out to sea, such as occurs in the southern and eastern states of the United States of America, to the mild convection waterspout, more nearly related to the minor whirlwind or dust devil ashore. The former is, of course, a most dangerous and destructive thing, whereas the latter may be fairly harmless.

In ancient days of mythology the waterspout was regarded as a gigantic sea serpent, dragon or other dire monster. In the *Arabian Nights* it is known as a manifestation of the Jinni or Evil Spirit. Throughout history there have been a number of methods supposed to be capable of destroying these phenomena. Recitations from the New Testament, the sign of the Cross, loud noises and exhortations were all considered to have good effect. In later days the firing of guns at a waterspout column was believed to " burst " it, and this erroneous belief has persisted in some quarters until quite recently.[1*]

There is great variety of form and intensity between different spouts and even during the various stages of the life cycle of any one spout. One of the highest spouts observed, measured by theodolite off the coast of New South Wales, was 5,014 ft. high. Short spouts of about 200 ft. are quite frequent, but the most common lengths are from 1,000 ft. to 2,000 ft. An abnormally thick spout has been observed 100 ft. high and 700 ft. in diameter, while at the other extreme one has been observed 1,050 ft. high and 3 ft. in diameter.

Although the ordinary waterspout should do no real damage to a steel steamship, it is something to be avoided by the small-boat mariner. As the " fair-weather spout " usually moves rather slowly and can be seen at some distance away, it is not hard to steer clear of it with a powered craft, unless it is at night or there are several spouts around at the same time. Sailing craft without power, becalmed in front of an oncoming spout, can do nothing but make the best of whatever comes.

An interesting account of a waterspout encountered in the seventeenth century appears in William Dampier's voyages. The ship was of 300 tons; yet it was manhandled and dismasted by a spout while *en route* from London to the Guinea Coast in 1674.[2]

> When we came into seven or eight degrees north, we saw several spouts, one of which came directly toward the ship, and we having no wind to get out of the way of the spout, made ready to receive it by furling the sails. It came on very swift, and broke a little before it reached the ship, making a great noise, and raising the sea round it, as if a great house, or some such thing, had been cast into the sea.
>
> The fury of the wind still lasted, and took the ship on the starboard bow with such violence that it snapt off the boltsprit and foremast both at once, and blew the ship all along, ready to overset it; but the ship did presently right again,

*The index numbers refer to the list of references on p. 60.

and the wind whirling round, took the ship a second time with the like fury as before, but on the contrary side, and was again like to overset her the other way. The mizzenmast felt the fury of the second blast, and was snapt short off, as the foremast and boltsprit had been before. The main mast and maintop mast received no damage, for the fury of the wind (which was presently over) did not reach them. Three men were in the foretop when the foremast broke, and one on the boltsprit, and fell with them into the sea, but all were saved.

The danger area for boats or planes around a waterspout is usually not more than a few hundred feet wide.

A tornadic or storm waterspout may damage even a steel steamship if it passes directly over it. The S.S. *Hestia*, an American vessel, passed through a fair-sized one off Cape Hatteras in 1902. During heavy and widespread thunderstorms several spouts were seen forming, the largest of which headed directly for the ship in such a way that it could not be avoided. The captain ordered all hands below decks, but remained out himself until the last moment. The oncoming spout was about 50 ft. thick, with an almost black core about 2 ft. across. As it struck the captain dived below. There was a deafening roar, strong wind gusts, and a sudden shock as the spout hit the ship. Bobbing out again on to the bridge, the captain saw two great hatch tarpaulins and a large plank high overhead; and the log-line from the taffrail, with the weighted spinner at its far end, extended straight up into the air like a large-sized Indian rope trick!

There have been a number of cases reported in sailing-vessel days where damage has been done when a ship has been struck by a waterspout. Many a sailing vessel lost her canvas, while others capsized under the shock of the impact.

Hurd[1] gives several examples of such reports. On 10th April, 1885, the barque *Ceylon*, in lat. 31°N., long. 71°W., was struck and her main and mizzenmasts carried away. The captain was injured and the first mate killed. The barque *Lillian Morris*, in 27°S., 42°W., was hit by the outer winds of a spout which stripped her of canvas and carried away a man. The schooner *Alice*, in 33°N., 61°W., was so wrenched by a spout that passed within 10 ft. of her that she became a total loss, but the crew were rescued on the following day. The American schooner *Baltic* was suddenly struck by a spout on 25th April, 1888, at 30°N., 76°W. She was " thrown on her beam ends, boats carried away, deck flooded and was obliged to cut the mainmast to right the vessel ". At 2.25 a.m., 30th March, 1923, the White Star liner *Pittsburgh* was struck in mid-Atlantic almost bow-on by a spout estimated to be 40 ft. to 50 ft. wide and more than 70 ft. high, as a mass of water filled the crow's nest that far above the waterline. Many tons of water were said to have dropped simultaneously on the forward superstructure. The bridge was wrecked, the chartroom badly damaged, electrical connections were destroyed and the officers' cabins flooded. No mention was made of the accompanying wind, but the water damage was such that the *Pittsburgh* stopped her engines for an hour to make repairs.

Waterspout damage to ships is caused partly by tornadic winds, partly by suddenly reduced pressure and partly by the deluge of water sometimes released. Although the funnel of a normal waterspout is composed of water droplets formed by condensation from the cooling caused by a reduction of pressure, it is believed that the more severe storm spouts carry considerable quantities of sea water up to fair heights.

Formation

There are a number of theories which attempt to explain the formation of a waterspout. In general, these theories may be classified into those which relate to the origin of the tornado storm spout and those which relate to the milder so-called fair-weather spout.

Although the tornado spout may form over the sea, it is more likely to have formed over the land and subsequently passed out to sea. The land tornado is indeed a terrifying phenomenon. It can produce the severest damage and loss of life. Its formation may result from the horizontal shear between warm and cold currents existing up to considerable heights in the atmosphere. Such conditions normally occur along a cold front or cold occlusion surface. In the southern and eastern states of the United States of America, in spring, elongated V-shaped troughs often occur at cold fronts separating very cold and dry polar continental air from very warm and moist tropical Gulf of Mexico air. The two favourable conditions of horizontal shear and extreme instability extending up to great heights, with a vast amount of latent heat of condensation, are therefore present and account for the occurrence of tornadoes in that area.

The formation of a fair-weather spout is believed to occur mainly by a convectional process. It is rather analogous to the small whirlwind or dust devil, which commences to form when, under conditions of high lapse rate of temperature near the surface, a patch of air becomes a little warmer than its environment and begins to rise. The surrounding air flows in from different directions or perhaps from the same direction at different speeds. An eddy starts and ascends like a spiral. In the desert, where, although the air is dry, there is a very high lapse rate, such eddies extend to several thousand feet, moving along in the general air current. The small dust whirl is limited in size and intensity by the energy available. The instability, though pronounced near the surface, may not extend very high. Little moisture is available to contribute latent heat of condensation. The conflicting winds that feed the eddy are merely local ground breezes, which are retarded in their movement by friction with the ground.

The fair-weather waterspout forms by a similar process. However, it is aided by the presence of considerable water vapour, which contributes latent heat of condensation. A small patch of air requires not only to be a little warmer than its environment to enable it to ascend and start eddy motion, but also perhaps just a little moister. Friction over the water surface is less than over the land. Thus, a fair-weather spout may be somewhat bigger and better developed than a dust whirl, even though the lapse rate near the water surface is less than over land.

A steep water-vapour gradient near the sea surface assists in the formation of a convectional waterspout over the ocean because of the slightly smaller density of water vapour compared with dry air.

C. S. Durst[3] has suggested that the initial convectional ascending current may occur directly below a cumulo-nimbus cloud. In this case the rising patch of warmer air may penetrate up to the cloud. As these currents are sucked into the elementary vortex formed by the ascending current the rotation will be increased until a complete spout is formed.

From observational experience it is known that a large number of

waterspouts are seen to appear from the base of a cumulo-nimbus cloud and build downwards.

Wegener[4] suggests that the vortex of every spout bends into a horizontal axis which is out of sight within the cumulo-nimbus cloud, and quotes one or two cases where this phenomenon has been observed. He suggests that the vertical vortex between cloud and surface is only an attendant phenomenon, and in no way influences the processes that are going on within the cumulo-nimbus cloud where the horizontal axis has already been formed. This horizontal axis is formed, according to the theory, as a result of the shear between the upward vertical currents within the cloud, the downward currents just ahead of the cloud and the increase of wind with height. The horizontal vortex then forms in the forward portion of the cloud, as it is only in this portion that the correct sense of rotation is found (Fig. 1).

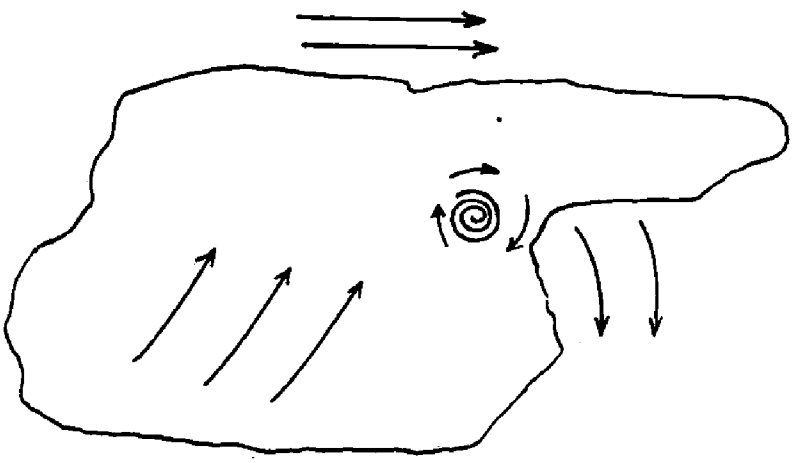

Fig. 1

Cross-section of a cumulo-nimbus cloud showing horizontal axis vortex after Wegener.

Once formed, the axis of the vortex may proceed to bend and grow downward either to the right or left of the cloud until it reaches the ground. However, before emerging from the cloud the axis may lengthen out a considerable distance from a relatively quiet portion of the cloud. The sense of rotation would always be rolling forward in the sense of the direction towards which the cloud was travelling.

One of the most evident proofs of this theory is the observed " sense of rotation " of the vortex, which would in theory be of cyclonic vorticity in the right-handed vortex and anti-cyclonic in the left-handed vortex, right and left-handed being taken in the sense of the direction towards which the cloud is moving. In fact, such vorticities have been observed, particularly in the case of right-handed cyclonic vorticities (Fig. 2).

An analogy to the formation of such eddy motion occurs when an oar is dipped into water while rowing a boat. On the forward side of the oar in the sense of the direction of travel of the boat, a horizontal axis eddy forms under water which bends up and reaches the water surface as two oppositely rotating surface eddies with vertical axes.

In general the main theories which have been formulated to explain the development of depressions, particularly the revolving, non-frontal (e.g.

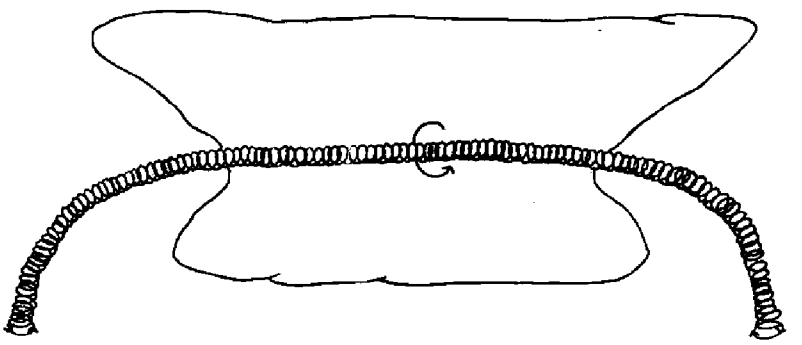

Fig. 2

Cross-section of cumulo-nimbus cloud moving toward the observer, indicating vorticities of the cloud whirl after Wegener.

tropical) type, can also be made applicable to the smaller waterspout vortices. A small mass of air rises. The fall in surface pressure thus initiated spreads to higher levels. The air is warmed relative to its environment as a result of the latent heat of the moisture condensed. The rising air current causes pressure to rise at upper levels over the vortex. Outflow at these levels then takes place.

As development of the vortex progresses the factors contributing to outflow of air within the column will gradually diminish and eventually cease, after which the column will commence to fill at the surface. The dynamic conditions which previously contributed to development will then be reversed, and contribute to filling and destruction of the vortex with increasing rapidity.

Mechanics of Rotation

In this treatment, we find it convenient to assume that the waterspout can be divided into two distinct parts : an inner vortex and an outer vortex, the inner vortex rotating as a solid disc and the outer vortex in such a manner that the product of the velocity and radius of any point remains constant. These conditions fulfil the known conditions regarding the distribution of velocities within a waterspout vortex.

The following symbols are used :

	Centre of Spout	Outer Boundary of inner Vortex	Inner Boundary of outer Vortex	Outer Boundary of outer Vortex
Pressure	p_c	p_a	p_b	p_o
Velocity of air ..	0	v_a	v_b	v_o

ρ = Density of air
ϕ = Latitude
ω = Angular velocity of earth.

Consider a point distant r from the centre of the vortex where the pressure is p and the velocity v.

The gradient wind equation for steady motion of a circular vortex without vertical motion reduces to :

$$2\ \omega\ v \sin\phi + \frac{v^2}{r} = \frac{1}{\rho}\frac{dp}{dr} \qquad \ldots (1)$$

in cylindrical co-ordinates with the vertical axis fixed relative to the earth.

For waterspouts, we can assume that $2\ \omega\ v \sin \phi$, the Coriolis parameter, is small in comparison with v^2/r and $(1/\rho)\ dp/dr$ and can be neglected. Hence we obtain the equation:

$$\frac{v^2}{r} = \frac{1}{\rho}\frac{dp}{dr} \qquad \ldots (2)$$

Let us assume that there is a frictionless surface with the air at rest and that there is no turbulence after the air has been set in motion. Then a small pressure difference will cause an immediate acceleration towards the lower pressure.

Inner Vortex. If it is assumed that the inner portion of the vortex rotates as if $v/r = \text{const.}$, i.e. as if it were solid, and assuming ρ = constant, then by integrating (2) we get:

$$p_a - p_c = \tfrac{1}{2}\rho\, v_a^2 \qquad \ldots (3)$$

Outer Vortex. Since the outer boundary of the spout must have a smaller angular velocity due to friction, it seems reasonable to assume the outer portion of the vortex rotates as if vr = constant. Hence, by integrating (2) we get:

$$p_o - p_b = \tfrac{1}{2}\,\rho\,(v_o^2 - v_o^2) \qquad \ldots (4)$$

Now since the outer boundary of the inner vortex is the inner boundary of the outer vortex, $p_a = p_o$ and $v_a = v_b$. Hence, from (3) and (4):

$$p_o - p_c = \rho\, v_a^2 - \tfrac{1}{2}\,\rho\, v_o^2 \qquad \ldots (5)$$

If v_o is small compared with v_a:

$$v_a = \sqrt{\frac{p_o - p_c}{\rho}}$$

Now since v_a is (1) the velocity at the outer boundary of a vortex that rotates as if v/r = constant, and (2) at the same time is the velocity at the inner boundary of a vortex that rotates as if $v\,r$ = constant, it is obvious that v_a is the maximum velocity of the whole vortex.

Table I shows the maximum velocities that are attained within the vortex for various pressure differences between the outside and the centre of the vortex. These velocities have been corrected for the decrease in density of the air, assumed saturated, consequent upon the decrease in pressure and temperature of that air. The velocities have not been corrected to allow for the fact that the velocity at the outer boundary of the whole vortex is not zero, but is probably quite appreciable. As can be seen from (5), this would have the effect of increasing the maximum velocities attained in the waterspout.

TABLE I. Relation between Maximum Velocity and Pressure Difference within a Waterspout Vortex

dp mb.	v metres/sec.	v knots
1	9	17
4	18	35
16	37	72
64	75	146
256	156	302

Structure

An interesting analysis of the structure of a waterspout has been given by Sir Nelson Johnson.[5] The analysis is made from photographs (shown below) of a waterspout taken from an aircraft in the Mediterranean in September, 1942.

Outstanding features observed were a helical upward spiral motion, a dark central core within the upper part of a main dense column, a diffuse lower main column extending from the upper dense column down to the sea, and where the column reached the sea, an annulus of spray enclosing a less dense region with an eye consisting of a diffuse foggy patch with a dark pupil in the middle. In this analysis suggested explanations are given for the existence of each specific part of the structure.

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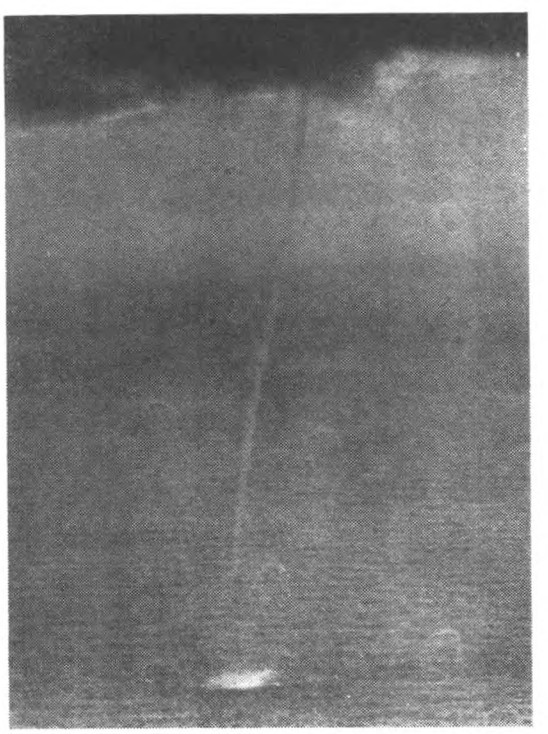
"Close-up" of the base of the waterspout.



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Full length of waterspout from cloud to sea.

In brief, observational evidence indicates that the normal waterspout consists of an apparent hollow tube of spiraling cloud particles, formed by condensation due to dynamic cooling from the reduction of pressure in the core. These particles are centrifuged out from the axial area of low pressure to form the visible walls of the tube. Around the base is a cascade or annulus of spray, which in a small spout may be 700 ft. wide and 400 ft. or more high.

As mentioned in the introduction, the heights of waterspouts may vary from 100 ft. to 5,000 ft. and the widths from a few feet to 800 ft. at the cloud base. They are most commonly from 1,000 ft. to 2,000 ft. high.

Basal mounds and depressions have both been reported on the sea surface within the core of the spout. Double-walled spouts have also been reported.

Waterspout Data

In the Marine Branch of the British Meteorological Office a considerable amount of data is available on the subject of waterspouts. Tabulated records have been made of all waterspouts that have been observed by British ships at sea. These records refer to the actual ship's meteorological log in which

the observation was originally noted. In the log, full meteorological observations for the time the spout was seen, or at least for the nearest corresponding routine observation hour, are available. Such observations include barometric pressure, dry and wet bulb temperature, wind direction and Beaufort force, cloud type and amount and special remarks. Some of the observations include drawings or photographs of the phenomenon. Thus it has been possible to tabulate all the relevant meteorological data which accompanied the occurrence of every waterspout observed and recorded in British ships during the present century.

This information has been correlated in a number of ways. Firstly, in order to obtain an idea of the relative distribution of waterspouts throughout the oceans of the world an approximate distribution map has been constructed (Fig. 5).

Secondly, in order to investigate the physical conditions in the atmosphere favourable to their formation, correlations have been carried out of the number of waterspouts observed in association with various meteorological elements as follows :

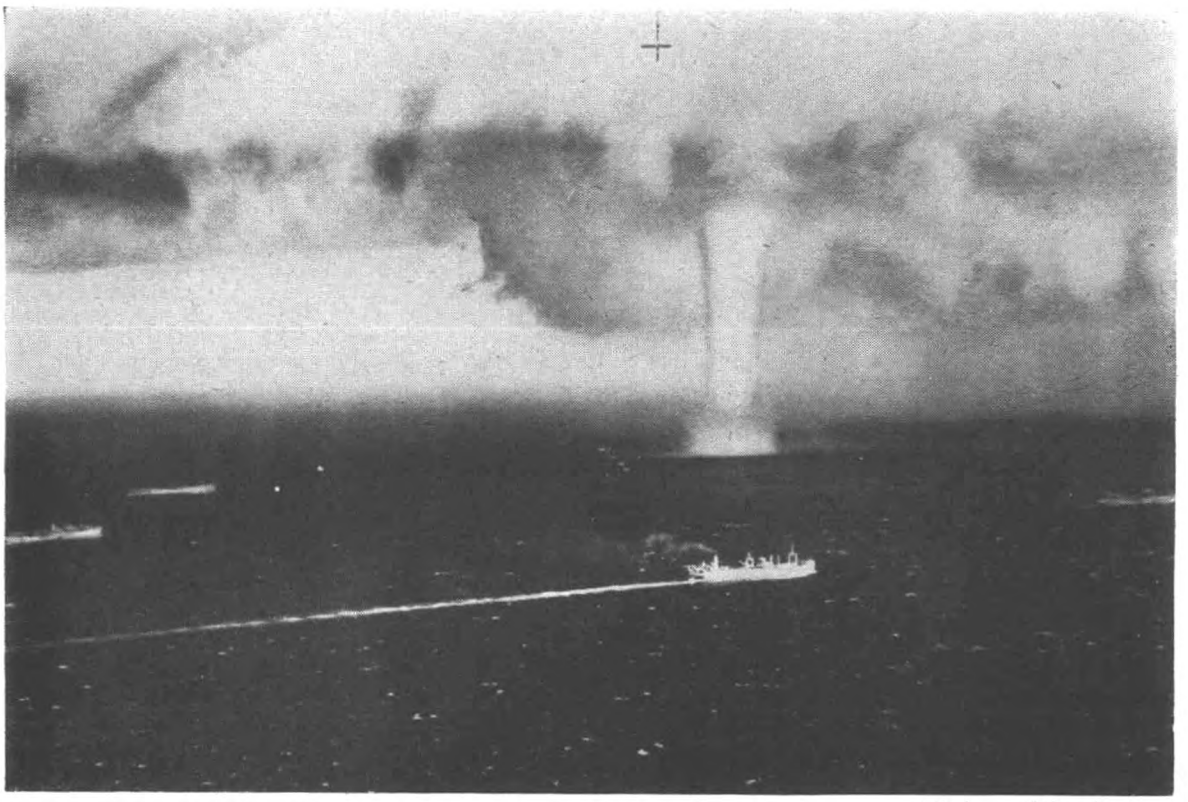
1. The number observed within each 5 mb. interval of surface barometric pressure between the limits of 975 and 1,040 mb.
2. The number observed for each 5°F. range in temperature of the sea and of the air from 30°F. to 95°F., and for each degree of difference between sea and air temperature.
3. The number observed for each gram per kilogram mixing ratio of the air and of saturated air at sea-surface temperature, and for each gm/kg difference in mixing ratio between the air and saturated air at the sea surface temperature.
4. The number observed for each wind direction for eight points of the compass and for each Beaufort force.
5. The number observed for each low cloud type and for each tenth of low cloud amount.
6. The number observed for each month of the year in the northern and southern hemispheres.
7. The number observed at each hour of the day in local sun time.

All the available data which have been tabulated and analysed in relation to the occurrence of waterspouts are confined to the surface layer. Thus, the most important element, the stability of the air, remains an unknown factor. Although an estimation of the lapse rate of the very thin layer of air between the sea surface and the level of the deck of the ship can be considered, this is only a very small part of the total evidence required to enable a true insight to be made into the formation of waterspouts.

Boundary Surface between Sea and Air

Before considering the results of the analysis of the data mentioned above, the properties of the boundary surface between the sea and the air will be discussed briefly.

In 1925–27 the German ship *Meteor* made an expedition into the oceans for the purpose of meteorological investigation.[6] The results of this investigation showed that a mean daily temperature fluctuation of the order of 0·45°F. existed in the upper-surface layer of the water in temperate latitudes. In the region of the Equator this diurnal variation amounted to a maximum mean value of 0·61°F.



Photograph by the R.A.F.

Waterspout in the eastern Mediterranean, 27th October, 1943, 0910 G.M.T. View from aircraft at 100 ft., waterspout ¼–½ mile distant.

Photograph by the R.A.F.

Waterspout in the eastern Mediterranean, 27th October, 1943, 0914 G.M.T. View from aircraft at 500 ft., waterspout ¼–½ mile distant.

In the open sea, the temperature difference between air and sea is almost entirely determined by the origin of the air mass. If the air has originated poleward from the point of observation, it will in general be colder than the underlying water surface, whereas if it originates Equatorward it will be warmer. The air layer in proximity to the water surface tends to adjust itself slowly to the temperature of the water surface. Radiation does not appreciably affect the surface air layer.

An analysis of records of air temperatures recorded aboard ships is apt to mislead to the conclusion that radiation causes an appreciable diurnal fluctuation of temperature. The results of the German expedition indicated that any such fluctuations were really due to the warming effect of the ship itself. These results showed that the true diurnal variation of air temperature over the sea mounted to only 0·54 to 0·90°F., and is therefore scarcely greater than the diurnal fluctuation of the surface layer of water itself.

An analysis of the diurnal variation of mean air temperature recorded aboard the ocean weather ships at station " Jig ", 53° 50'N., 18° 40'W., covering a period of approximately 12 months in 1947–48, showed an average diurnal variation of 1·0°F. for this part of the North Atlantic. A share of even this small value is probably caused by the heating effect of the ship.

On certain days, however, when the sky is clear, the sun high in the sky and the wind calm, there are appreciable fluctuations of temperature, both of the sea and the air, both diurnal and distributed locally over a horizontal area. Measurements were taken on such a day in July, 1948, at station " Jig ", from a small rubber dinghy at a considerable distance away from the ship. These observations showed local fluctuations of 2°F. between 57°F. and 59°F. in the temperature of both sea and the air. The air and sea temperature values were not superimposed on one another. These results confirm that radiation has very little direct effect on the air temperature, but that it may affect the sea temperature to some extent through penetration and absorption. The air temperature then adjusts itself to the sea temperature through contact.

Such local variations would no doubt be considerably greater and more frequent in tropical regions, where the sky is often broken or clear and the sun high in the sky.

If the velocity of the wind over the sea surface is greater than about 13 knots the air flow is turbulent, while if it is less than this value it is laminar. If the air flow is turbulent, the vertical gradient of temperature within the depth of vertical turbulence should adjust itself within the limits of the dry and wet adiabatic lapse rates, and the bottom of the layer should gradually approach the sea-surface temperature. Initially, however, there should be a sharp discontinuity between sea and air temperatures, even at the point of contact. If the air flow is laminar, the bottom of the layer should approach the temperature of the sea surface more rapidly and the vertical gradient of temperature need not necessarily become adjusted within the adiabatic lapse rates.

The air layer in contact with the water therefore becomes gradually modified. As the sea surface becomes rougher, this air layer becomes mixed with spray. In really rough seas there can be no true air layer in contact with the sea. The properties of the air layer in contact with the water surface can therefore only be examined in special cases of fairly calm weather.

Some measurements of temperature and vapour pressure over the first 2 metres above the sea surface, off the Baltic coast of Germany, have been made by Wust from the side of a small boat. An Assmann aspiration psychrometer was used. Figs. 3 and 4 illustrate the curves of values found. Twenty-six trials were made, of which 17 were cases when the water was warmer than the air and 9 were cases when the water was colder than the air. The latter were mainly taken during the middle of the day.

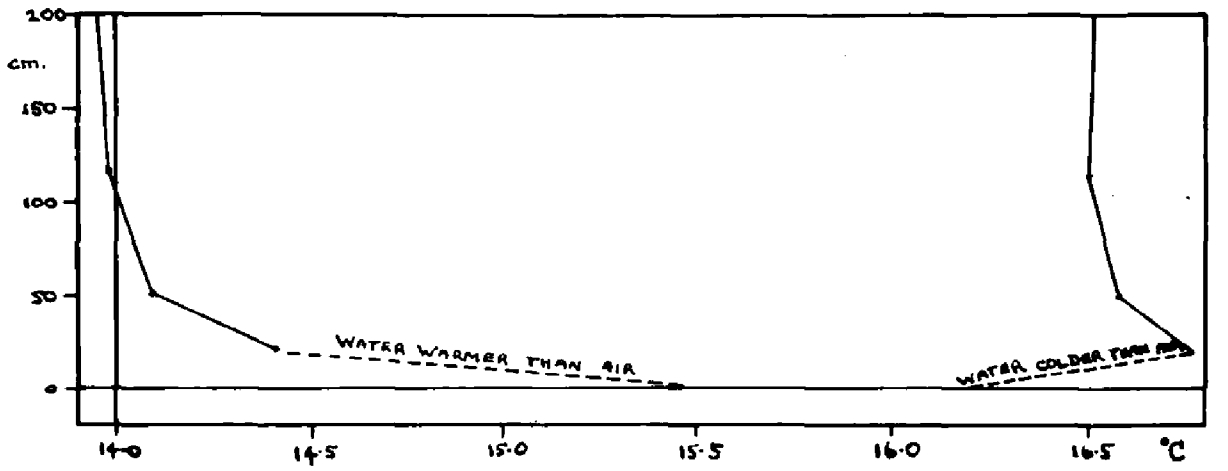


Fig. 3
Temperature Gradient over the sea, from experimental results of Wust.

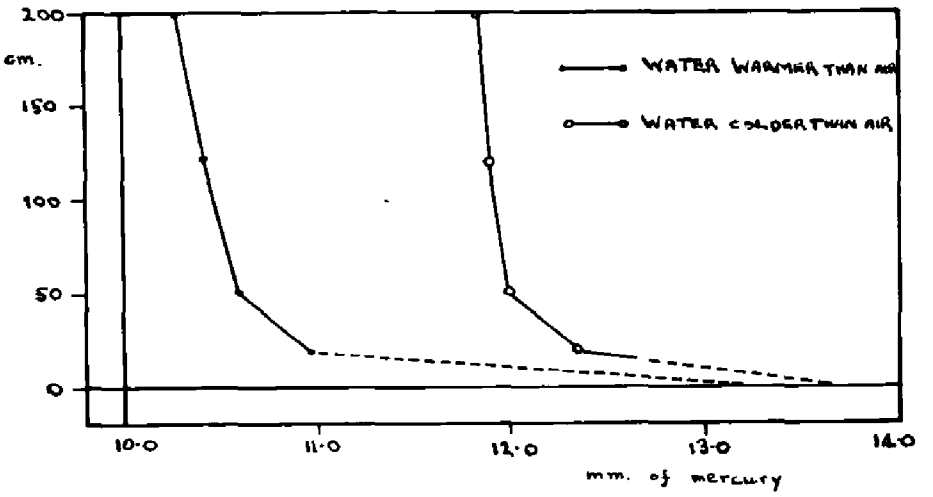


Fig. 4
Vapour-Pressure Gradient over the sea, from experimental results of Wust.

It is noted that the temperature curve down to 20 cm. above the water surface is essentially the same in both cases. It rises slowly down to 50 cm. above the water and then more rapidly down to 20 cm. The temperature of the sea and the saturation vapour pressure of the air at that temperature have been taken for zero height.

Figs. 3 and 4 contain strong experimental evidence that a discontinuity does exist at the boundary surface between sea and air temperature and vapour pressure values. Such a discontinuity tends to create an unstable skin layer of air just above the sea surface, when the water is warmer than the air.

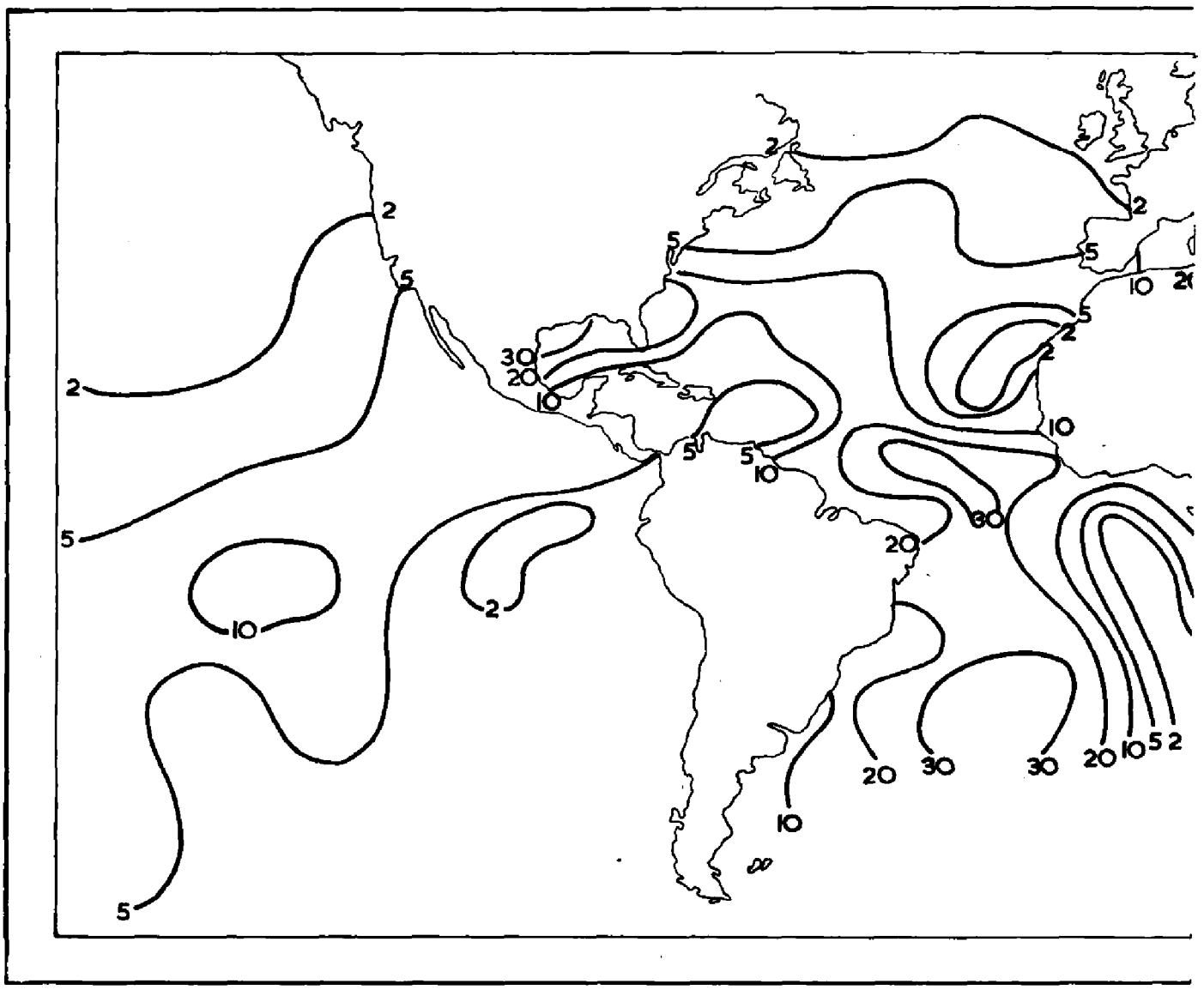


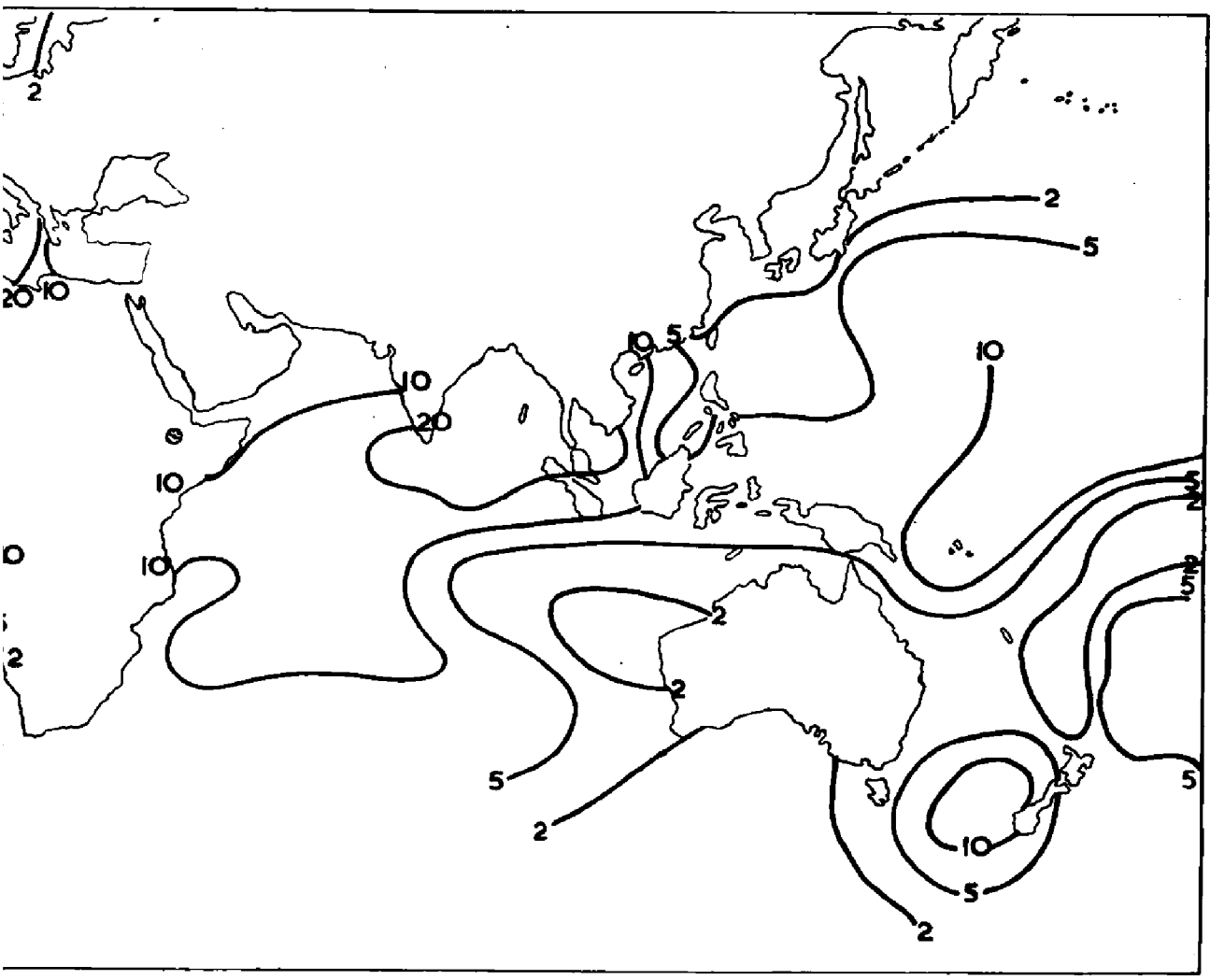
Fig. 5 Frequency Distribution

Isopleths represent the number of waterspouts reported

Frequency Distribution of Waterspouts

The isopleths in Fig. 5 represent the number of waterspouts reported per 10,000 ships' observations. Considerable smoothing of the isopleths has been carried out in areas where the total number of ships' observations is unduly small (e.g. less than 1,000). The distribution in Fig. 5 implies that waterspouts are most frequent in the Doldrums, Gulf of Mexico and the Mediterranean. These regions are characterised by high or relatively high sea and air temperatures.

It is noted that a greater frequency of spouts appear on the warmer or western sides of the sub-tropical anticyclones. Very few appear on the opposite sides, which are associated with cool Equatorward-blowing winds and cool ocean currents caused by upwelling of water. This is noticeable off the coasts of Morocco, South-West Africa and Peru, where areas of low frequency are shown.



f Waterspouts.

er 10,000 ships' observations, 1900–1947 (British Observing Ships)

The distribution of the waterspouts in Fig. 5 indicates broadly that they occur over regions having high or relatively high sea and air temperatures for the latitude, where consequently unstable conditions are likely to exist. They do not occur very often in regions having cold or relatively cool sea and air temperatures for the latitude, where stable conditions are therefore likely to exist.

The distribution of waterspouts in Fig. 5 may be divided into 10° zones of latitude, taking both hemispheres together (Table II).

TABLE II. Number of Spouts reported in each 10° zone of latitude, taking both hemispheres together.

Zone Degrees of Latitude	Number of Spouts reported
0–10	311
10–20	159
20–30	155
30–40	264
40–50	84
50–60	21
above 60	0
Total	994

Considering the distribution shown above from a zonal point of view, the maximum number are reported in the Doldrums, where ascending motion occurs to great heights in the atmosphere. Between 10° lat. and 30° lat. subsiding air in the subtropical anticyclones may tend to reduce high lapse rates and consequent ascending motion. Between 30° and 40° ascending motion occurs again, as a result of the heating of polar air by warm seas and the establishment of high lapse rates by advection. Above 40° lat. the seas become colder and the maximum tendency for instability due to advection of cold air and warm water steadily decreases towards the poles.

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(To be concluded in the April, 1951, *Marine Observer*)

NEW ZEALAND METEOROLOGICAL SERVICE

The following is an extract from a letter from Mr. Barnett, Director of the New Zealand Meteorological Service, to Sir Nelson Johnson, Director of the British Meteorological Office:

"The co-operation accorded this service by British Selected Ships is excellent, one particular incident worthy of note being the voluntary information supplied to this office by the W/T operator of the *Port Chalmers*, Mr. Gunner. Outward bound from New Zealand, he listened in and supplied reports on the strength and readability of an automatic weather station that was on test in Wellington until his ship was out of range."

ANTI-LOCUST CAMPAIGN

Co-operation of ships needed

An extensive anti-locust campaign is being organised in the Middle East and Eastern Africa, the planning of the campaign being based on a wide network of reports on the movements of locust swarms. These reports are collected and analysed for the purpose of forecasting further developments in the locust situation.

The network over land areas is fairly close and comprehensive; many locust swarms, however, cross in their flight the Red Sea, Gulf of Aden, Persian Gulf and Arabian Sea.

Voluntary observers in the past have usually noted and recorded such swarms in their meteorological logbooks. This information is valuable for record purposes, but swarms flying over the sea would land somewhere, and it is essential that their movements should immediately be known to anti-locust organisations which are concerned with forecasting the danger from swarms and in organising counter measures.

The Meteorological Office has received a letter from the Director of the Anti-Locust Research Centre requesting ships' co-operation in the campaign. He asks ships to report locust swarms by radio to DESLOC NAIROBI as promptly as possible and through the most convenient coastal radio station. The cost of these messages will be borne by the Desert Locust Survey, P.O. Box 5152, Nairobi, Kenya.

When reporting locust swarms the following points should be included:

(1) Latitude and longitude.
(2) Date and hour.
(3) Wind direction and speed.
(4) Size of swarm.
(5) Colour of locusts (yellow, pink, grey).
(6) Direction in which swarm appears to be moving.

Apart from flying swarms, locusts floating in the sea should also be reported.

A specimen message would read as follows:

"02° 30'N. 50° 15'W. 0830 G.M.T. Wind 220°. 12 knots. Dense swarm three miles extent yellow locusts moving 270°."

A note should be made in the remarks column of the logbook whenever such a radio message is sent.

ERRATUM

July, 1950, *Marine Observer*, page 155

The arrows on the dotted vortices in Fig. 1b should point in the opposite directions to those shown. In a letter from Mr. F. G. Millar, in whose article "Air current revealed by soaring gulls" this diagram appeared, he states that Figs. 1a and 1b should be viewed separately and not in conjunction with each other. He goes on to say that the lines of updraft and down-draft are independent and unrelated in the air and in the water, but the patterns are similar because they are similarly caused.

SOUTHERN ICE REPORTS

During the year 1949

JANUARY

Date	Position		Description	Remarks
	Latitude	Longitude		
		S.S. *Southern Opal*		
	° ′	° ′		
25	53 08S	15 09E	Bergs.	Small bergs to southward.
26	54 05S	17 50E	Bergs.	Bergs to N and S.
	55 41S	21 17E	Bergs.	Bergs to N and S.
	56 12S	23 47E	Bergs.	Bergs to N and S.
27	56 34S	24 34E	Berg.	Berg to N.
	57 07S	26 18E	Bergs.	Bergs in sight.
28	58 08S	32 03E	Bergs.	Bergs in sight.
29	58 51S	38 19E	Berg.	Berg to E.
	59 08S	42 50E	Bergs.	Bergs in sight.
30	59 27S	46 38E	Bergs.	Bergs in sight.

FEBRUARY

Date	Position		Description	Remarks
	Latitude	Longitude		
		S.S. *Southern Opal*		
	° ′	° ′		
2	60 43S	69 21E	Berg.	Large berg to N.
3	60 53S	72 34E	Bergs.	Large bergs in sight.
	60 57S	74 45E	Bergs.	Numerous bergs.
4	61 05S	79 44E	Bergs.	Numerous bergs.
	61 18S	83 08E	Bergs and bergy bits	Numerous bergs and bergy bits in sight all around vessel.
5	61 27S	86 34E	Bergs.	Numerous bergs.
6	61 51S	94 31E	Bergs.	Icebergs in sight.
	61 58S	97 43E	Bergs.	Bergs sighted.
	62 04S	100 26E	Bergs.	Bergs sighted.
7	62 06S	102 16E	Bergs.	Bergs sighted.
	62 33S	104 17E	Bergs.	Bergs sighted.
	63 03S	105 46E	Bergs.	Bergs sighted.
8	64 21S	108 20E	Bergs.	A few bergs in sight.
	64 50S	110 19E	Bergs and pack-ice.	Bergs and pack-ice in sight to S.
9	64 50S	110 19E	Bergs and pack-ice.	Bergs and pack-ice in sight to S.
10	64 54S	110 33E	Bergs and pack-ice.	Bergs and pack-ice to S.
11	64 54S	110 28E	Pack and new ice.	New ice all around ship. Pack close to.
12	66 54S	110 17E	Pack-ice.	Pack-ice to S.
13	64 52S	110 19E	Pack-ice.	Pack-ice to SE.
14	64 52S	110 40E	Pack-ice.	Pack-ice all around.
15	64 30S	110 56E	Pack-ice.	Pack-ice to S and W.
16	64 29S	111 28E	Pack-ice.	Pack-ice to E, S and SW, afar off.
17	64 25S	112 12E	Pack-ice.	Pack-ice from N through W to SE. Close-to.
18	64 25S	112 12E	Pack-ice.	Light pack in the vicinity.
	64 25S	112 12E	Pack-ice.	Pack-ice from NE through W to SW.
19	64 25S	112 12E	Pack-ice and bergs.	Pack-ice to NE. A few bergs in sight.
20	64 25S	112 12E	Pack-ice and growlers.	Pack-ice from N to W. Growlers all around.
21	64 25S	112 12E	Bergs.	A few small bergs all around.
	64 50S	113 03E	Bergs.	A few small bergs all around.
22	64 48S	112 42E	Berg.	One berg in sight.
23	65 06S	112 35E	Bergs.	Several bergs in sight.
	64 48S	112 35E	Bergs.	Several bergs in sight.
24	64 52S	112 12E	Bergs.	Several bergs in sight.
	65 04S	113 36E	Bergs and pack-ice.	Several bergs and broken pack in sight.
25	65 06S	112 54E	Bergs and pack-ice.	Several bergs to E. Broken pack all around
	65 02S	112 37E	Bergs.	Some bergs visible to N.
26	64 58S	112 09E	Berg.	One berg in sight.
	64 52S	113 06E	Bergs and pack-ice.	A few bergs to SE. Broken pack all around.
27	64 43S	114 02E	Bergs and pack-ice.	Bergs and pack in sight.
	64 36S	113 46E	Bergs and pack-ice.	A few bergs and pack-ice all around.
28	64 30S	113 44E	Pack-ice.	Loose pack all around.
	64 36S	113 56E	Pack-ice and bergs.	Loose pack all around. A few bergs in sight.

Date	Position		Description	Remarks
	Latitude	Longitude		
			S.S. *Southern Opal*	
	° ′	° ′		
1	64 38S	113 54E	Pack-ice.	Loose pack all around.
2	64 41S	113 15E	Berg.	One iceberg in sight.
	64 49S	113 00E	Pack-ice.	Line of pack-ice 9 miles to SE. Scattered pack-ice all around.
	64 45S	112 42E	Pack-ice.	A few pieces scattered pack-ice all around.
3	64 56S	112 38E	Pack-ice.	Loose pack-ice all around. Line of pack from E–S.
4	65 03S	112 28E	Berg.	One small berg to SE.
5	65 08S	111 59E	Pack-ice.	Several large pieces of pack-ice around.
	65 11S	111 42E	Berg.	One berg to SW (radar).
6	65 14S	111 20E	Berg.	One berg in sight.
	65 05S	111 13E	Pack-ice.	Pack-ice from E–SE.
	65 04S	111 00E	Pack-ice.	Loose pack-ice all around.
7	65 06S	110 45E	Pack-ice.	Loose pack-ice all around.
	65 17S	109 16E	Pack-ice and bergs.	Pack-ice and new ice all around. Numerous bergs in sight.
	65 20S	109 00E	Bergs and new ice.	Several large bergs in sight. New ice all around ship.
8	65 20S	108 56E	New ice.	New ice all around ship.
	65 20S	108 07E	New ice and bergs.	Several large bergs.
	65 23S	108 28E	New and pack-ice, bergs.	Large bergs, pack and new ice all around ship.
9	65 26S	108 30E	New and pack-ice, bergs.	Large bergs, pack and new ice all around ship.
10	65 19S	108 32E	Pack-ice and bergs.	Pack-ice and bergs all around.
	64 41S	106 35E	Bergs.	A few bergs in sight.
11	64 00S	103 11E	Bergs.	Several bergs in sight.
	63 59S	100 30E	Pack-ice.	One piece of pack-ice in sight to S.
	63 59S	98 06E	Bergs.	Few bergs in sight.
12	63 25S	93 22E	Bergs.	Several bergs in sight.
	63 25S	91 09E	Bergs.	Several bergs in sight.
	63 14S	88 42E	Bergs.	Several bergs (radar).
13	63 14S	84 18E	Bergs.	Several bergs (radar).
	63 00S	79 55E	Bergs.	Occasional bergs sighted.
14	62 55S	74 00E	Bergs.	A few bergs in sight.
16	58 54S	53 08E	Berg.	One berg abeam to starboard.
17	58 03S	50 15E	Bergs.	One berg on each beam.
18	55 38S	44 48E	Bergs.	One berg to S, one berg to NE.
20	50 42S	35 31E	Berg.	One berg to S.
	49 03S	33 21E	Berg.	Large berg on port beam, distance 4 miles.
			S.S. *Southern Harvester*	
10	65 23S	108 14E	Hummocked ice and bergs.	In bay formed by hummocked ice. Numerous large tabular bergs.
	65 20S	108 21E	Hummocked ice and bergs.	In bay formed by hummocked ice. Numerous large tabular bergs.
12	65 18S	108 25E	Pack-ice.	Loose pack-ice around.
	65 06S	108 17E	Pack and drift-ice	Completely surrounded by pack-ice. Open drift-ice to northward.
	65 22S	108 10E	Pack-ice and new ice	Completely surrounded by pack-ice. New ice forming on water.
13	65 26S	108 04E	New ice.	New ice forming on water.
	65 28S	107 46E	New ice.	New ice forming on water.
	65 17S	108 00E	Pack-ice.	Heavy pack-ice around.
14	65 17S	107 03E	Pack-ice and bergs.	Heavy pack-ice and large bergs to southward.
15	65 01S	106 27E	Pack-ice and bergs.	Heavy pack-ice and large bergs to southward.
	65 04S	106 08E	Pack-ice and bergs.	Heavy pack-ice and large bergs to southward.
16	65 00S	105 50E	Pack-ice and bergs.	Heavy pack-ice and large bergs to southward.
	64 53S	106 20E	Pack-ice and bergs.	Heavy pack-ice and large bergs to southward.
17	65 05S	105 33E	Pack-ice.	Vessel jammed in by heavy pack-ice.
	65 00S	105 33E	Bergs.	Occasional bergs. In open water.
19	64 48S	104 12E	Bergs.	Ten large bergs to eastward, appear to be aground.
20	64 45S	103 55E	Bergs and pack-ice.	Several bergs and some pack-ice in vicinity.
	64 28S	104 43E	Bergs and pack-ice.	Several bergs and some pack-ice in vicinity.
21	64 29S	104 34E	Pack-ice.	In shelter of pack-ice.
	64 12S	103 52E	Pack-ice.	In lee of pack-ice (wind 160°).
22	64 09S	104 06E	Pack-ice.	Pack-ice to southward.
23	64 08S	104 00E	Pack-ice	Sheltered by pack-ice.
24	63 51S	103 45E	Pack-ice.	Among loose pack-ice.
25	63 48S	103 35E	Pack-ice.	Pack-ice to southward.
27	63 47S	103 40E	Pack-ice.	Strips of loose pack-ice.
28	63 58S	103 48E	Pack-ice.	In shelter of pack-ice.

JANUARY

Date	Position		Description	Remarks
	Latitude	Longitude		
			S.V. *John Biscoe*	
	° ′	° ′		
19	62 06S	59 42W	Bergs.	Four bergs.
20	62 24S	58 58W	Bergs.	Six bergs.
	62 27S	59 02W	Bergs and bergy bits.	Numerous bergs and bergy bits.
	62 38S	58 32W	Pack, bergs and bergy bits.	Pack-ice (not examined), probably from Antarctic Sound. Numerous bergs and bergy bits N of pack.
24	63 36S	62 19W	Bergs.	Numerous bergs between Hoseason and Low Island.
			S.S. *Southern Collins*	
19	55 40S	00 50W	Bergs.	Several small bergs sighted during previous three hours.
	56 36S	02 42W	Bergs and growlers.	Numerous bergs and growlers.
	56 55S	05 00W	Bergs and growlers.	Numerous bergs and growlers.
20	58 30S	07 20W	Bergs and growlers.	Numerous bergs and growlers.
	59 20S	09 10W	Bergs.	Three bergs.
21	60 20S	11 40W	Bergs.	Two bergs.
	60 29S	13 29W	Bergs.	Three bergs.
			S.S. *Southern Garden*	
26	54 44S	39 36W	Bergs.	Two bergs.
27	56 48S	43 03W	Bergs.	Numerous small bergs.
			S.S. *Southern Harvester*	
1	58 36S	6 25E	Bergs.	Three bergs.
	58 31S	6 31E	Bergs.	Six bergs.
2	58 10S	6 48E	Bergs.	Four Bergs.
	58 06S	6 40E	Bergs.	Eleven bergs.
3	58 18S	6 30E	Bergs.	Six bergs.
4	58 20S	6 40E	Bergs.	Four bergs.
6	57 19S	6 20E	Bergs.	Two bergs.
7	57 20S	6 50E	Bergs.	Four bergs.
9	56 50S	7 26E	Berg.	One berg.
10	57 42S	5 45E	Bergs.	Two bergs.
	57 58S	5 38E	Bergs.	Seven bergs.
11	60 02S	3 03E	Bergs.	Three bergs.
12	60 49S	0 28W	Bergs.	Three bergs.
	60 51S	0 14W	Bergs.	Three bergs.
13	60 53S	0 06W	Bergs.	Two bergs.
	61 00S	0 33W	Bergs.	Three bergs.
15	61 31S	3 56W	Bergs.	Two bergs.
	61 31S	4 21W	Berg.	One berg.
16	61 22S	8 30W	Berg.	One berg.
17	61 18S	8 42W	Bergs.	Two bergs.
	61 18S	9 22W	Bergs.	Two bergs.
19	61 20S	10 12W	Bergs.	Three bergs.
	61 28S	10 16W	Bergs.	Two bergs.
20	60 54S	13 24W	Bergs.	Four bergs.
21	60 43S	13 20W	Bergs.	Two bergs.
22	60 28S	14 15W	Bergs and bergy bits.	Five bergs and a few bergy bits.
23	60 47S	13 36W	Bergs.	Two small bergs.
25	61 01S	18 52W	Bergs.	Four small bergs.
27	61 06S	20 10W	Bergs.	Fourteen bergs.
28	61 04S	21 25W	Bergs and drift-ice.	Eleven bergs and widely scattered drift-ice.
30	61 03S	23 25W	Bergs.	Eighteen bergs.
			S.S. *Southern Opal*	
1	59 08S	02 17W	Bergs and growlers	Five bergs, 6,000 ft. long, 100 ft. high (estimated).
	58 36S	07 32W	Bergs.	Nine bergs, 6,000–8,000 ft. long, 200 ft. high (estimated).
2	58 36S	11 10W	Bergs and ice strips.	Eight bergs, 2,000 ft. long, 80–90 ft. high. Ice strips 3–4 miles in length but very thin and narrow.
	58 30S	12 50W	Bergs and ice strips.	Six bergs, average length 2,000 ft., height 60–80 ft. Ice strips 9–10 miles long but thin and narrow.
	51 44S	13 33W	Pack-ice and bergs.	Pack-ice sighted. Altered course to pass 2–3 miles off the edge of pack (course 270°).
6	59 51S	19 35W	Bergs and growlers.	Average length of bergs, 1 mile by 100–150 ft. high.
7	59 35S	19 50W	Bergs and growlers	One large berg, 3,000 ft. long by 150 ft. high.
8	57 42S	26 48W	Bergs and growlers.	Average berg, length 1,500 ft., height 100–150 ft.
	56 59S	26 25W	Bergs and growlers.	Six large bergs, length 1,000 ft. by 150–200 ft. high.
9	56 37S	31 50W	Bergs and growlers.	Three large bergs, length 1,000–1,800 ft., and mostly flat in appearance.

Date	Position		Description	Remarks
	Latitude	Longitude		
			S.S. *Southern Venturer*	
	° ′	° ′		
3	58 10S	21 15W	Bergs.	Many scattered bergs.
4	59 31S	20 40W	Bergs.	Many scattered bergs.
9	60 53S	22 50W	Bergs.	Getting cleared of bergs.
10	59 49S	25 33W	Pack.	Ice pack reported to N, 15 miles distant.
14	59 53S	31 30W	Pack.	Lying off moderately heavy pack.
			S.S. *Thule*	
16	66 48S	170 48W	Pack.	Lying to leeward of ice-pack, 4–5 miles away (wind 270°).
23	66 17S	163 27W	Pack.	Lying to leeward of ice-pack (wind 225°).

FEBRUARY

Date	Position		Description	Remarks
	Latitude	Longitude		
			S.V. *John Biscoe*	
7	Pack-ice encountered *en route* from Argentine Is. to Marguerite Bay. There was extensive pack-ice S of Argentine Is. Bismarck Strait was solid pack, despite aircraft report of at least 10 miles of clear water along south coast of Anvers Is. the previous day. The ship had great difficulty in forcing a passage between Buff Is. and Joubin Islets through pack composed largely of brash and small floes in considerable pressure. Numerous grounded bergs off Joubin Islets.			
	° ′	° ′		
8	64 28S	65 10W	Bergs.	Seventeen large and medium-sized bergs.
	65 14S	66 56W	Bergs.	Nine medium bergs.
9	66 26S	70 18W	Bergs.	Two medium bergs.
8, 9	Approximate limit of pack-ice: from Cape Albert de Monaco, Anvers Is., NW for 17 miles, thence SW past Victor Hugo Is. to position 67° 10′S., 71° 17′W., where ship entered pack. Course was steered to pass S of Maurice Faure Is., thence E to Neny Fjord. Clear water was reached 10 miles E of Maurice Faure Is.			
9	The following types of pack-ice were encountered: (*a*) Eighty miles of open pack, with numerous small bergs. (*b*) Twenty-five miles of close pack composed of large level floes, which had presumably come from the fjords of Marguerite Bay. (*c*) Three miles of close heavy pack composed of very large and thick level floes, probably from King George VI Sound. (*d*) Very large scattered pans between the main pack and coast of Graham Land.			
9–12	Fast ice, 18 miles thick, joined Neny Is. and NE Glacier, extending one mile SE of Stonington Is.			
12	On returning in almost exactly the same track, the large floes from King George VI Sound had opened out and were no longer a serious difficulty. The remainder was open pack, much the same as before.			
13	Bismarck Strait reported by aircraft to be 10 tenths pack-ice.			
14	65 19S	69 00W	Bergs.	Numerous icebergs on radar.
	to			
	64 31S	66 48W		
	64 24S	65 18W	Bergs.	Large concentration of bergs NW of Victor Hugo Is.
	64 17S	63 03W	Bergs.	Dallman Bay clear of ice except for grounded bergs.
17	63 41S	62 18W	Bergs.	Many bergs on radar.
20	62 35S	59 08W	Bergs.	Numerous small tabular bergs in Bransfield Strait.
	62 05S	58 25W	Bergs.	One very large tabular berg, recently split in two, grounded in Admiralty Bay.
21	61 46S	56 06W	Bergs.	Three bergs.
	61 08S	52 05W	Bergs.	Numerous " castle " bergs.
22	60 48S	47 18W	Bergs.	Innumerable bergs on radar while approaching Signy Is.
28	60 43S	46 46W	Bergs.	Innumerable grounded bergs along south coast of Coronation Is. and Inaccessible Is.
			S.S. *Southern Collins*	
13	55 30S	33 24W	Bergs.	Forty-one bergs.
14	58 42S	33 12W	Bergs.	Five bergs.
	59 30S	32 20W	Bergs.	Two bergs.
15	61 12S	30 30W	Bergs.	Eighteen bergs.

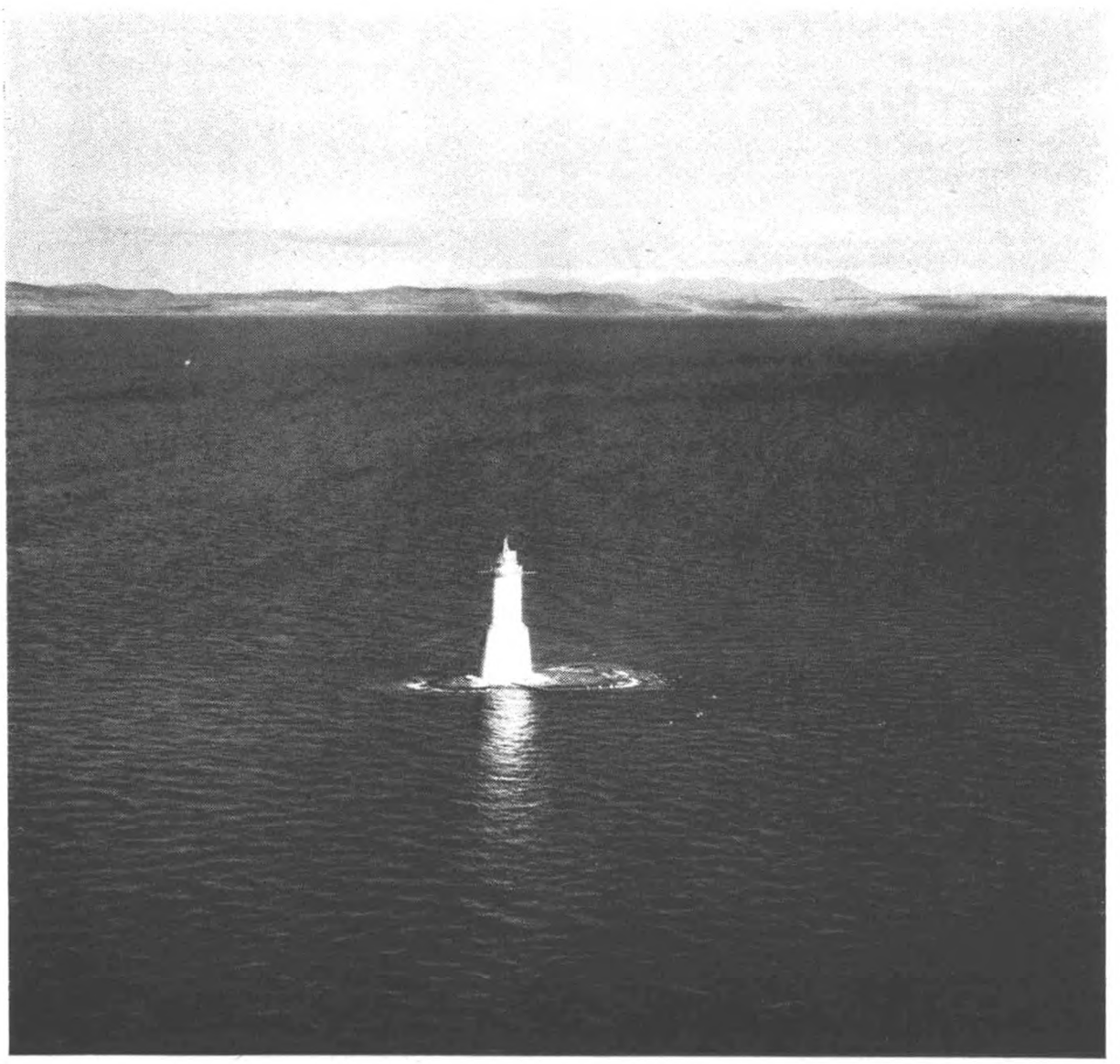
Date	Position		Description	Remarks
	Latitude	Longitude		
	S.S. *Southern Harvester*			
	° ′	° ′		
1	61 03S	23 46W	Bergs.	Eight bergs.
2	61 13S	25 08W	Bergs.	Two bergs.
3	61 00S	26 10W	Bergs.	Three bergs in radar.
	60 53S	26 15W	Bergs.	Three bergs in radar.
4	61 06S	28 21W	Bergs and drift-ice.	Three bergs in radar and scattered drift-ice
5	61 35S	27 45W	Bergs and pack-ice.	Four bergs in radar. Pack-ice to S.
	61 35S	26 45W	Bergs.	Two bergs in radar.
6	61 18S	24 23W	Bergs.	Two bergs.
7	61 01S	22 27W	Bergs.	Two bergs.
	61 04S	22 26W	Bergs.	Five bergs.
8	61 49S	20 10W	Bergs.	Two bergs.
10	62 20S	20 42W	Berg.	One berg.
11	62 39S	20 48W	Berg.	One berg.
21	62 00S	44 35W	Bergs.	Numerous bergs.
	61 55S	46 57W	Bergs.	Numerous bergs.
22	61 40S	50 18W	Bergs.	Four bergs.
	61 26S	52 00W	Bergs.	Many bergs.
27	61 26S	54 20W	Bergs.	Few bergs.
28	62 17S	55 00W	Pack-ice and bergs.	Pack-ice to SW. Several bergs.
	61 48S	53 00W	Bergs.	Four bergs.
	S.S. *Southern Venturer*			
4	62 38S	50 20W	Bergs.	Masses of small bergs, break-offs from very heavy pack.
5	62 39S	50 53W	Pack.	Heavy pack lying SE–NW in a direction SW of ship.
9	62 02S	52 00W	Pack.	Pack-ice to eastward.
10	62 18S	51 30W	Pack.	Pack-ice SE–S–SW.
11	62 06S	50 34W	Pack.	Lying to lee of pack (wind 220°).
12	62 00S	48 45W	Pack.	Lying to lee of pack (wind 220°).
14	61 52S	47 56W	Pack.	Lying to lee of pack (wind 315°).
18	61 56S	49 52W	Pack.	Lying in pack-ice.
24	62 05S	54 30W	Pack.	Lying to lee of pack (wind 090°).
	S.S. *Struan*			
11			Bergs.	Several small bergs sighted up to a distance of 75 miles from entrance to harbour of Leith, South Georgia.
	S.S. *Thule*			
9	67 36S	171 11W	Pack.	Near ice-pack.
10	67 28S	171 28W	Pack.	Near ice-pack.
17	67 38S	170 44W	Pack.	Alongside ice-pack.

MARCH

Date	Position		Description	Remarks
	Latitude	Longitude		
	S.V. *John Biscoe*			
	° ′	° ′		
1	61 50S	51 30W	Pack-ice.	Heavy pack-ice reported by S.S. *Southern Harvester* in this position.
27	63 13S	61 01W	Bergs.	Five medium bergs.
	64 06S	62 53W	Bergs.	Four medium bergs.
	64 18S	62 53W	Bergs.	Anderson Harbour, Melchior, was clear of ice on 16th February, foul with small bergs on 27th March and sufficiently clear of bergs for the ship to anchor on 30th March.
	64 29S	62 56W	Bergs.	Discovery Sound was clear of ice except for a few small bergs.
29	65 05S	63 55W	Small floes, bergs and bergy bits.	Lemaire Channel and Penola Strait filled with medium close pack, composed of small floes, many small bergs and bergy bits of glacier ice. The ice in Lemaire Channel was moving NE at approximately 1½ knots, measured by difference in position of small berg over a period of 7 hours. Calm prevailed in and to the S of Lemaire Channel. Wind NE × N, force 3.
31	63 54S	62 57W	Bergs.	Three small bergs.
	63 24S	61 25W	Bergs and bergy bits.	Six small bergs and some bergy bits.

Date	Position		Description	Remarks
	Latitude	Longitude		
	S.S. *Southern Harvester*			
	° ′	° ′		
1	61 40S	46 07W	Berg, pack-ice.	One berg. Pack-ice to S.
2	61 45S	45 30W	Bergs.	Four bergs.
3	62 30S	46 00W	Bergs.	Two bergs.
4	62 43S	45 45W	Pack-ice.	Pack-ice to SW.
5	62 10S	45 48W	Bergs, pack-ice.	Many bergs. Pack-ice to WSW.
10	62 00S	54 28W	Bergs.	Few small bergs.
	S.S. *Thule*			
4	67 32S	172 00W	Pack.	Ship lying to leeward of ice-pack (wind 010°

LIGHTHOUSES OF THE BRITISH ISLES



SKERVUILE

Skervuile Lighthouse, viewed here from the W.N.W., is built on Skervuile, a rock situated at the southern entrance to the Sound of Jura. The tower is 83 ft. in height

PERSONNEL

RETIREMENT.—CAPTAIN J. C. BROWN, C.B.E., R.D., R.N.R. (retd.), retired from the sea with the arrival of the *Pretoria Castle* at Southampton on the 7th July last, having commanded that vessel since her maiden voyage in 1948.

Captain Brown, one of the few shipmasters today holding an extra-masters' square-rigged certificate, commenced his sea career as an apprentice in the barque *Strathdon*, sailing three times round the world before he was 20. Joining the Union Castle Line in 1908 as fourth officer of the *Norman*, Captain Brown served in many of the company's ships and received his first command in the *Eider* in 1936.

As a Royal Naval Reserve officer from midshipman in 1903 to captain in 1935, Captain Brown served throughout both world wars, and during the recent war commanded the troopships *Windsor Castle*, until sunk by aerial torpedo, and then *Arundel Castle*. Twice commended for brave conduct and good service, Captain Brown was appointed a C.B.E. in 1945 in recognition of outstanding services in carrying many thousands of troops.

Returning to Union Castle service after the war, Captain Brown was appointed Commodore of the fleet in 1946 in the *Capetown Castle*, and in 1948 transferred his flag to the new liner *Pretoria Castle*.

Captain Brown's first connection with the Meteorological Office was as third officer of the S.S. *Durham Castle* from 1911 to 1914. From 1921 onward, meteorological logs have been received from many Union Castle ships under his command.

After his retirement Captain Brown travelled in his old ship to South Africa, where he is spending his retirement, and we wish him health and happiness there.

J. R. R.

OBITUARY.—We regret to record the death of CAPTAIN P. B. CLARKE, M.V.O., O.B.E., D.S.C., R.D., R.N.R., of the New Zealand Shipping Company's ship *Rangitiki*.

Peter B. Clarke was born in 1894. After two years with an engineering firm on the Clyde, he went to sea in April, 1914, as a midshipman in Messrs. Devitt & Moore's full-rigged ship *Medway*. In December that year, shortly after the outbreak of war, he entered the Royal Naval Reserve as a midshipman. As a sub-lieutenant in 1916 he was mentioned in despatches. After being demobilised in 1919, he joined the New Zealand Shipping Company as a fourth officer in January, 1920. He passed his examination for master in 1922 and, after being promoted through the various grades, was appointed to his first command, the S.S. *Otaki*, in 1929.

In October, 1939, he was in command of the *Sussex* when, outward bound, she detonated a magnetic mine in the Thames Estuary, and had to return to London for repairs. The *Sussex* was attacked and badly damaged by a German aircraft in September, 1940, when west of Ireland. The aircraft was driven off by gunfire and the ship was able to reach the Clyde. Captain Clarke was awarded by O.B.E. for this action, and several of his crew were also decorated. He was in command of the *Rimutaka* in 1944 when she took the Duke and Duchess of Gloucester to Australia. For this service Captain Clarke was made a Member of the Victorian Order. In 1949 he succeeded Captain Holland in command of the *Rangitiki* and was in her until his death, which occurred on the 9th October, 1950, following an operation.

Captain Clarke had been a member of the Honourable Company of Master Mariners since 1928. He had been associated with the Meteorological Office since 1929, and many excellent logs were returned from the ships under his command.

C. H. W.

OBITUARY.—We regret to announce the death of CAPTAIN D. C. SANDISON, commander of the fishery research vessel *Explorer*, who died recently in Aberdeen. Captain Sandison was very well known in the port of Lerwick. He had been a voluntary observer for the Meteorological Office since 1936, and as his vessel was frequently in waters where shipping is rather sparse, his observations were extremely useful. The *Explorer* operated from Aberdeen for some considerable time, and her duties took her to Norway, Faroes and Shetlands.

During the first World War Captain Sandison was in command of minesweepers, and was awarded the D.C.M. and Croix de Guerre. When that war ended, he joined the service of the Scottish Fishery Research Board and rose to become Commodore of that service.

During the last war he was engaged on escort duties at sea.

C. E. N. F.

FLEET LIST (Great Britain)

VOLUNTARY OBSERVING SHIPS

The following is a list of British ships voluntarily co-operating with the Marine Branch of the Meteorological Office.

The names of the Captains, Observing Officers and Senior Radio Officers are given as ascertained from the last written returns received. The date of receipt of the last return received is given in the third column.

All returns received from observing ships will be acknowledged, direct to the ship, by the Marine Superintendent.

The Port Meteorological Officers and Merchant Navy Agents at the ports will make personal calls on the Captains and Observing Officers as opportunity offers, or on notification from the ship at any time when their services are desired. (See under Notices to Marine Observers.)

Excellent awards are made at the end of each financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards are published in a special list in *The Marine Observer*.

It is requested that prior notification of changes of service, probable periods of lay-up, transfer of Captain, or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to the appropriate Port Meteorological Officer or Merchant Navy Agent.

Captains are requested to point out any errors or omissions which may occur in the list.

Selected Ships

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Accra	GJSW	8.9.50	A. G. Baptiste	R. Munro, R. F. Blinkhorn, T. A. Nicholson	J. A. Stuart	Elder Dempster Lines, Ltd.
Afghanistan	GNYB	8.5.50	W. A. Chappell	G. L. Andrews, R. A. Pennell, R. B. Arthur	J. Isherwood	F. C. Strick & Co., Ltd.
Ajax	GJXM	18.3.50	P. Cross	E. B. Bertelsen, S. Barbour, N. Robertson, H. Bowers, D. S. Moreby	W. Akhurst	A. Holt & Co.
Akaroa	GMLP	1.5.50	J. Steele	H. P. Last, A. R. Stephenson, G. K. Lowis	J. W. Soulsby	Shaw Savill & Albion Co., Ltd.
Alcantara	GLQR	1.5.50	H. D. Hooper	J. Fulford, R. Frizell, J. Gunns	R. E. Hammond	Royal Mail Lines, Ltd.
Alcyone Fortune	MAQC		F. Osler, M.B.E.	J. L. Paine, J. Blackburn	R. Dolby	Alcyone Shipping Finance Co., Ltd.
Amakura	MCPN	18.8.50	A. J. Carter	R. Halliday, H. Adler, —. Williams	I. R. Davies	Booker Bros., McConnell & Co., Ltd.
Amastra	GYDD	23.1.50	R. Ashby Todd	R. Hedley, C. Close, J. Bizzey	R. Dunne	Anglo-Saxon Petroleum Co., Ltd.
Amersham	GNTQ	14.7.50	A. Spence	T. Brand, E. T. Ward, D. Frazer	J. Brown	Thompson S.S. Co., Ltd.
Andes	GQCV	4.10.50	B. K. Berry, R.D., Cmde., R.N.R.	R. D. Jones, A. Jewers, W. Wheatley, F. M. Dickenson, D. B. Cairns	W. Smith	Royal Mail Lines, Ltd.
Apapa	MACE	16.12.49	J. J. Smith	R. G. Williams, C. A. Smith, J. Wright, S. S. Jenkins, T. A. Nicholson	R. F. Barrett	Elder Dempster Lines, Ltd.
Arabia	GLKF	8.7.50	W. T. Fitzgerald	R. Jones, K. T. Jones, R. M. Watt	B. A. Long	Cunard Steamship Co., Ltd.
Arabistan	GCKK	21.3.50	J. E. Cook	A. K. Linton, P. Hewitt, J. C. Purdy	W. Davies	F. C. Strick & Co., Ltd.
Araby	GMZL	29.8.50	T. W. Bolland	P. J. Robinson, G. A. Wright, M. G. Boyd	A. J. Cumming	Royal Mail Lines, Ltd.
Arakaka	GDVN	5.8.49	A. A. Gerrard	D. Douglas-Kerr, C. Nolan, P. M. Flower	J. A. Davis	Booker Bros., McConnell & Co., Ltd.
Argentina Star	GTKF	18.10.50	D. R. Macfarlane, O.B.E., D.S.O.	A. Smith, M. J. Slessor, C. Davy	J. Eastwood	Blue Star Line, Ltd.
Argyll	GBWB	18.10.50	J. Dodds	A. W. Fielding, G. W. Millbanke, L. Lumley	J. J. Smith	B. J. Sutherland & Co., Ltd.
Ariguani	GMBL	4.1.49	G. S. Gracie	R. D. Phillpott, P. Furnival, P. Howells	A. N. Taylor	Elders & Fyffes, Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Armadale	GMCR	4.8.50	E. J. Ridout	W. L. Babbs, G. M. Leggate, J. Baxter, G. C. Evidge	N. Gray	Trinder, Anderson & Co.
Arundel Castle	GCZL	28.9.49	C. G. Gorringe			Union Castle Mail S.S. Co., Ltd.
Ascania	GKNJ	28.11.49	J. V. Locke, R.D., R.N.R.	G. L. Mitchell, N. R. Haddon, G. H. Griffiths	M. O'Donnell	Cunard Steamship Co., Ltd.
Ashburton	GNJN	14.11.49	F. W. Mould	C. F. Woodcock, D. A. Keats, L. Browne	J. S. Buchanan	Trinder, Anderson & Co.
Asia	GLJV	23.1.50	B. Harrison	M. T. Dodds, D. J. Steff, P. King, R. Parry	W. J. Rainey	Cunard Steamship Co., Ltd.
Assyria	GGKX		G. H. Morris	P. Miller		Cunard Steamship Co., Ltd.
Asturias	GLQS	13.2.50	H. G. Whittle, O.B.E.	—. Lawson, —. Morganti, —. Edwards, —. Cutler	—. Hunt	Royal Mail Lines, Ltd.
Athelchief	GCRG	16.1.50	J. H. Flockhart	R. V. Parkiss, N. Jones, A. Green	W. Bradbury	Tankers, Ltd.
Athelregent	GQWL	4.1.50	J. A. Russell	R. Nicholson, R. McGregor, W. H. Buckle	A. Williams	Athel Line, Ltd.
Athenic	GBLS	4.8.50	B. Forbes-Moffatt	W. A. Hutchison, P. G. Clifford, J. K. Mudd	D. Haggart	Shaw Savill & Albion Co., Ltd.
Athlone Castle	GYTK	3.10.50	C. C. Page	B. G. Evans, F. J. Pigeon, R. M. McNeil	J. H. Summers	Union Castle Mail S.S. Co., Ltd.
Atlantis	GLTM	20.7.50	A. R. Osburn	J. F. Anderson, M. Bialowski, J. Upton, J. Chester, G. H. Burdon	H. Mathews	Royal Mail Lines, Ltd.
Auricula	GKPV	2.6.50	H. Sangster	H. Young, C. Eastwood, M. Lee	R. Davies	Anglo-Saxon Petroleum Co., Ltd.
Australia Star	GYCS	19.6.50	G. M. Duff, G.M.	K. C. Crompton, S. Davies, M. R. Harry	L. Cooper	Blue Star Line, Ltd.
Australind	GJKF	2.6.50	J. F. Wood	D. Ewan, J. H. Looker, R. Mattingley	K. F. Kipping	Trinder, Anderson & Co.
Avondene	MAWG	14.6.50	W. L. Hall	J. R. Dixon, R. L. Jones	J. Smallwood	Dene Shipping Co., Ltd.
Balantia	GBNM	29.8.50	C. C. Dingle	D. B. Keefe, W. C. L. Sturrock, B. Y. Harrison, R. L. Collins	K. Arthur	Royal Mail Lines, Ltd.
Baltara	GTXM	4.1.49	G. E. Thomas	E. E. R. Roberts, R. E. G. Simmons, —. Davies, —. Morgan	C. James	United Baltic Corp., Ltd.
Balaena	GLDG		P. Virik			United Whalers, Ltd.
Baron Elphinstone	GCCD		S. Williams	A. Campbell		H. Hogarth & Sons
Baron Maclay	GKXW	5.6.50	J. Reid	J. S. Cameron, J. W. Cameron, W. O'Neill	J. Hopkins	H. Hogarth & Sons
Bassano	GNXK	8.7.50	C. H. Tutty	F. Smith, —. Saltmarshe, H. Walker	G. Shilson	Ellerman's Wilson Line, Ltd.
Beaverburn	MAGB	20.3.50	J. B. Smith, O.B.E.	G. Graves, T. F. Hercus, W. C. Halliday, P. A. Le Patourel	T. Ainsworth	Canadian Pacific S.S., Ltd.
Beavercove	GNLX	20.12.49	D. Parson, R.D., R.N.R.	D. P. Blois, R. D. P. Gillett, A. H. R. Peace, R. R. Rawlings	J. A. McAskill	Canadian Pacific S.S., Ltd.
Beaverdell	GBBS	22.9.50	N. C. H. Scallon, R.D., Cmde. R.N.R.	G. Bateman, G. Palmer, —. Fraser	L. Norton	Canadian Pacific S.S., Ltd.
Beaverford	MQJG	8.7.50	R. A. Leicester, O.B.E.	E. R. Connerton, E. R. Shaw, A. Aikman, D. Wallace	W. L. Poingdestre	Canadian Pacific S.S., Ltd.
Beaverglen	GBCP	6.2.50	J. Soame	L. Kinns, B. Dunham, J. Mackay, P. Ainsworth, R. A. Jones	R. Burch	Canadian Pacific S.S., Ltd.
Beaverlake	GBCQ	14.3.50	C. L. de H. Bell, D.S.C., R.D., Capt. R.N.R.	R. Savage, B. Snell, J. Waling, T. Sargent	W. Chick	Canadian Pacific S.S., Ltd.
Beckenham	GCGK	18.1.50	D. Cameron	G. T. Sharpe, W. Gibson, M. G. King	A. W. T. Camp	Watts, Watts & Co., Ltd.
Benarty	GCZZ	14.3.50	D. S. Sinclair	M. J. Peyton-Bruhl, A. King, J. Bain, G. M. Gall	R. Dixon	W. Thomson & Co.
Bendoran	MYSF		H. F. Masson	R. Winn, K. Parker	J. E. Kemp	W. Thomson & Co.
Benmhor	GDVV	22.5.50	J. P. Robertson	J. B. Butterworth, C. K. Hoffman, P. Shiels	P. V. Richmond	W. Thomson & Co.
Bennevis	MAGG	30.12.49	T. M. Blaikie	D. G. McPherson, A. Hay	A. Pagan	W. Thomson & Co.
Benreoch	GDJT	13.4.50	J. B. Hastie	D. A. Ross, R. McPhee, J. Shields	I. M. Fraser	W. Thomson & Co.
Benvannoch	GCDZ		A. M. Robertson	R. G. Faulkner		W. Thomson & Co.

Benvrackie	GBTZ	13.4.50	W. O. Atkinson	J. Clements, I. M. Bruce, T. Lindsay	J. L. Wells	W. Thomson & Co.
Benwyvis	MYPW	26.1.49	K. Hardie	E. N. Stone, G. Speirs, G. K. Harrison	J. Whyman	W. Thomson & Co.
Bibury	G1FC	2.6.50	W. E. Brett	F. E. Barley, D. S. Craven, R. B. Leach	R. Biss	Houlder Bros. & Co., Ltd.
Biscoe	GDCW		D. Cornwell			Hector Tankers, Ltd.
Boynton Wyke	GBZV		G. Clixby			West Dock Steam Fishing Co., Ltd.
Brasil Star	GTLF	22.11.49	T. Williams	L. J. Thompson, F. P. McGuckin, F. Wood	J. Waddell	Blue Star Line, Ltd.
Bravo	GLDZ		W. Hill	C. Everingham, J. McAndrew, J. H. Spandler	F. E. Smith	Ellerman's Wilson Line, Ltd.
Brisbane Star	GZCJ	18.4.50	S. Foulkes	A. Lewin, P. G. Willard, A. H. White	R. G. Thomson	Blue Star Line, Ltd.
Britannic	GDXF	4.9.48	R. Sell, R.D., R.N.R.	M. J. Dodds, R. McDougall, G. K. Westerman	—. Kidson	Cunard Steamship Co., Ltd.
British Colonel	GFDB	11.1.50	H. J. Saddler	L. Ashburn, J. MacKay, D. H. Henderson	P. Murray	British Tanker Co., Ltd.
British Endeavour	GFCN		J. E. Stead	J. Irvine		British Tanker Co., Ltd.
British Endurance	MLZM	29.12.47	W. Watkin Thomas, O.B.E., D.S.C.	A. D. Millar, S. H. Falconer, P. C. Coyne	A. E. Adams	British Tanker Co., Ltd.
British Energy	GLBK	3.3.50	R. Smyth	A. Davies, J. A. Frost, D. P. Monaghan	N. Holdridge	British Tanker Co., Ltd.
British Escort	GCRB	13.4.50	H. H. Burke	J. A. G. Millar, S. A. Sanderson, F. Darby	A. V. Murray	British Tanker Co., Ltd.
British Hussar	GJVR	8.5.50	R. Phillips	A. R. Tuckett, G. W. Reeve, D. E. Ritchie	D. Glen	British Tanker Co., Ltd.
British Lancer	MAGS	8.5.50	F. S. Hall	K. W. Nicholls, E. G. Freeman, J. E. Wynn	W. Brownlie	British Tanker Co., Ltd.
British Marquis	GWVL	25.10.49	J. W. Kemp	U. A. Maggs, C. F. Williams, P. N. Dawson	R. Lee	British Tanker Co., Ltd.
British Patience	GUFF	2.6.50	W. Jackson	R. D. Smithsons, A. D. Browne, A. Carter	R. R. Stevenson	British Tanker Co., Ltd.
British Pilot	GCQT	20.9.50	J. H. Nelson	B. N. Jarvis, J. Forrest, I. M. Ferrier	M. G. Rodger	British Tanker Co., Ltd.
British Piper	GDNN	25.4.50	J. P. M. Samson	J. Picken, B. H. Moore, G. R. Gray	L. Trestrail	British Tanker Co., Ltd.
British Power	GZGG	15.10.48	K. M. Mitchell	A. Fraser, P. F. Mason, E. C. Ford	F. G. Rimmington	British Tanker Co., Ltd.
British Resource	GFCD	15.5.50	J. C. Lea, O.B.E.	G. Symons, R. I. S. Elder, P. D. Fitchen	V. Dalton	British Tanker Co., Ltd.
British Statesman	GJNR	14.10.50	A. H. Newby	L. McRitchie, J. A. Lamb, E. K. Williams	D. Dixon	British Tanker Co., Ltd.
British Swordfish	GCQV					British Tanker Co., Ltd.
Brittany	GMZS	23.2.49	H. A. Wright	J. Fox, J. Kavanagh, —. Wood	G. Mitchell	Royal Mail Lines, Ltd.
Brockleymoor	GDWP	26.11.49	D. J. Jones	F. K. Venus, W. Pattison, J. S. Clarke	N. W. Hodgson	Walter Runciman & Co., Ltd.
Byron	GNFL		J. Byrne	M. F. Fair, W. A. Sparks, P. Moulds	—. Pryor	Lamport & Holt Line, Ltd.
Cairnavon	GPJN	24.7.50	J. W. Scott	C. Sutherland, C. Percy, J. Holland, J. Lobban	W. P. Greaves	Cairns, Noble & Co.
Cairnesk	GMKR	1.5.50	I. G. Foster	J. Hogg, W. Errington, G. Makin, W. Fraser	E. Johnston	Cairns, Noble & Co.
Cairnvalona	GQKM	5.9.50	G. R. Norvell	N. E. Forth, R. R. Campbell, D. Prudham	T. W. Lawson	Cairns, Noble & Co.
Caledonia	GCKR	5.9.50	E. J. Stormont, M.B.E.	T. L. Langlands, D. Barclay, A. Macadam	S. J. D. Taylor	Anchor Line, Ltd.
Canton	GDDT	24.7.50	G. Stable	E. T. Griffiths, M. Connell, M. D. Pearey	J. R. C. Johnson	Peninsular & Oriental Steam Navigation Co.
Capetown Castle	GKGM	1.7.50	J. McReynolds, D.S.C.	C. Walker, E. Pickles, R. Clark	J. Gilbart	Union Castle Mail S.S. Co., Ltd.
Cape York	GCZS	19.1.50	C. A. Jones	J. Fairgreaves, J. Macleod, J. Bruce	S. Gracie	Lyle Shipping Co., Ltd.
Carlton	G1FE	20.4.49	K. Wardale	A. Dodd, W. A. Morriss, A. A. Abdullah	J. Park	R. Chapman & Son
Carnarvon Castle	GJSL		J. F. Oakley	—. Kenshole, H. W. Madden, —. Schmidt	W. Brown	Union Castle Mail S.S. Co., Ltd
Caronia	GYKS	31.7.50	D. W. Sorrell	—. Bryce, —. Jolliffe, R. Ibbotson	G. M. Parsons	Cunard Steamship Co., Ltd.
Carthage	GRNX	12.8.50	E. R. Bodley, D.S.O.	D. Parsons, R. A. Gibbons, B. B. Jones	W. H. Chick	Peninsular & Oriental Steam Navigation Co.
Caslon	MCJR	13.4.50	J. M. Cherry	P. F. Carnochan, L. C. Burton, J. F. Thompson	J. McKenzie	Runciman (London), Ltd.
Cavina	GKFV	8.7.50	T. H. Bull	J. Nicholson, G. L. Foster, N. Abbot	E. Loft	Elders & Fyffes, Ltd.
Caxton	GCDX	19.1.49	G. Blacklock	F. Hamilton, R. Crawford, J. G. Wilson	A. Austin	Runciman (London), Ltd.
Ceramic	GFLM	29.8.50	A. V. Richardson	T. de M. Ogier, B. H. Clarke-Lens, L. M. Howells	H. V. Littlecot	Shaw, Savill & Albion Co., Ltd.
Cerinthus	GCRM	8.7.50	J. F. Auld	B. P. Payling, D. W. Alford	F. O. Holt	Houlder Bros. & Co., Ltd.
Cheshire	GLXV	14.7.50	P. H. Potter	A. Cameron, G. D. Atkinson, A. Ditchfield	J. L. Banks	Bibby Bros. & Co.
Chinese Prince	GDJC	29.6.50	C. J. P. Martin	P. R. Edwards, R. G. C. Roberts, M. A. Howell	T. D. Bailey	Prince Line, Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Chitral	GLKN	25.11.49	G. C. Forrest, R.D., Cmde. R.N.R.	J. Chester, E. Snowden, J. A. Lefevre ..	A. R. Porter ..	Peninsular & Oriental Steam Navigation Co.
Cilicia	GDGL	10.10.49	R. Blake	D. McDiarmid, J. B. Ballantyne, A. MacKendrick	J. Malcolm	Anchor Line, Ltd.
Cingalese Prince ..	GFRC		J. D. Fraser			Prince Line, Ltd.
City of Barcelona ..	GTKR	10.1.50	—. Groundwater	A. M. Bowman, P. Appleton, R. E. Greenwood	W. Dobbie	Ellerman Lines, Ltd.
City of Bristol ..	GCPN	2.6.50	G. Vickers	T. Irvine, A. J. Bickerton, P. G. C. Simpson	K. P. Grocock ..	Ellerman Lines, Ltd.
City of Calcutta ..	GLYX	6.2.50	H. Johnson	D. Wardlow, D. Campbell, D. McKinnon	H. Elder	Ellerman Lines, Ltd.
City of Cape Town ..	GBBQ	21.4.50	W. R. Pinchbeck	W. S. Fletcher, P. Redhead, F. Smith ..	D. S. Crombie ..	Ellerman Lines, Ltd.
City of Carlisle ..	GBJK	12.10.50	W. A. Hannah, O.B.E. ..	J. Ingoldsby, H. Swinney, I. B. Taylor, M. Langram	D. Vernall	Ellerman & Bucknall S.S. Co., Ltd.
City of Chester ..	MAHN	8.7.50	E. M. Robertson	P. Appleton, V. W. Pinnington, N. Paskin	J. Moran	Ellerman Lines, Ltd.
City of Delhi	GLBW	8.11.49	J. W. Wotherspoon ..	J. P. Mason-Price, I. Irvine, W. Smith ..	A. Dennis	Ellerman Lines, Ltd.
City of Derby ..	GFWC	30.8.49	W. A. Hannah	R. Tyrrel, J. Twomey, R. Huntingdon ..	R. Macdonald ..	Ellerman Lines, Ltd.
City of Dieppe ..	GSVQ	18.8.50	E. G. Chapman	J. Thompson, E. G. A. Smith, L. Aspinall	K. Allies	Ellerman Lines, Ltd.
City of Durham ..	GBJM	1.9.50	H. G. Williams, O.B.E. ..	M. F. Ayers, D. S. Taylor, A. I. Crossland	H. Wilson	Ellerman Lines, Ltd.
City of Evansville ..	GJNF	14.11.49	D. C. Hamilton	A. Fry, J. S. Schofield, J. Checkley ..	J. Oultram	Ellerman Lines, Ltd.
City of Johannesburg	GBKW	25.4.50	A. G. Freeman	C. H. Routledge, H. Lewis, T. Gorny, R. A. Vaughan	A. R. Henderson ..	Ellerman Lines, Ltd.
City of Khartoum ..	GBZC	14.6.50	J. A. Beynon	C. P. Bradbury, C. T. Heywood, J. B. Lister, R. F. Moon	R. Greenhalgh ..	Ellerman Lines, Ltd.
City of Lille	GSLN	14.11.49	W. A. Owen	R. B. May, H. M. Steele, G. S. Garner	A. Julius	Ellerman Lines, Ltd.
City of Lyons ..	GMCN	27.10.50	G. A. Ring	L. H. King, K. C. Powell, F. W. More ..	C. Pollitt	Ellerman Lines, Ltd.
City of Paris ..	GFQM	8.7.50	H. Percival, O.B.E., R.D., Cmde. R.N.R.	W. Wick, R. B. Perry, J. Lane, J. Wharry	B. J. Holyoake ..	Ellerman Lines, Ltd.
City of Pretoria ..	GBLN	29.3.50	R. Longstaff, D.S.C. ..	D. Salt, F. Braddick, W. Taggart ..	J. Booth	Ellerman & Bucknall S.S. Co., Ltd.
City of Swansea ..	GBZT	17.3.50	M. L. Hernan, M.B.E. ..	E. G. O'Driscoll, J. A. Whieldon, E. N. Williams	W. Bateman ..	Ellerman Lines, Ltd.
City of Sydney ..	GSFM	24.8.49	J. Johnson	B. Walker, J. Blanch, E. E. Cooper ..	H. D. Smythe ..	Ellerman Lines, Ltd.
City of Tokio ..	GFMW		R. L. Stewart	E. Bonfield, R. H. Bellhouse, E. Redshaw	—. McTighe ..	Ellerman Lines, Ltd.
City of Windsor ..	GJYR	22.8.50	W. S. Doidge	G. G. Francis, W. Singleton, A. G. Brooks	T. J. Rattray ..	Ellerman & Bucknall S.S. Co., Ltd.
Clan Brodie	GKPD	28.3.50	B. Vernon-Browne ..	J. Jones, S. F. Nicholson, K. A. Kerr, I. Williamson	W. M. Morrison ..	Cayzer, Irvine & Co., Ltd.
Clan Buchanan ..	GKNM	1.7.50	J. Browne	J. H. Wright, F. King, J. P. McMasters ..	J. H. Wright ..	Cayzer, Irvine & Co., Ltd.
Clan Campbell ..	GDZK	4.1.49	A. Macintyre	C. C. Atkinson, W. Muir, W. Dilks, J. Stormont	R. F. Cole	Cayzer, Irvine & Co., Ltd.
Clan Chattan ..	GFBX	16.9.50	H. C. Simpson, O.B.E. ..	F. H. Turton, G. A. Berry, R. Schooling	E. Shillabeer ..	Cayzer, Irvine & Co., Ltd.
Clan Chisholm ..	GFBY	27.2.50	J. McCrone	R. D. Helm, D. Godfrey, A. G. Allson, J. A. Lionnet	J. A. Gray	Cayzer, Irvine & Co., Ltd.
Clan Davidson ..	MAWU	3.10.50	H. J. Anchor, O.B.E., R.D., R.N.R.	H. Locker, I. W. Bennett, M. J. Skillington	J. E. Appleton ..	Cayzer, Irvine & Co., Ltd.
Clan Forbes	GPGB	1.9.50	W. R. Woodriffe	D. de Vall, J. S. Cumming, J. S. Catterall	W. G. Peddie ..	Cayzer, Irvine & Co., Ltd.
Clan Macaulay ..	GZCS	12.7.49	A. G. Storkey	T. R. Halliday, M. P. R. Turner, D. S. Clark	J. Ormerod	Cayzer, Irvine & Co., Ltd.
Clan Macdonald ..	GCPG	22.8.50	H. Cater	A. M. Banks, W. S. Clarke, C. D. Hedges	G. Martyn	Cayzer, Irvine & Co., Ltd.
Clan Macdougall ..	GFBQ	16.12.49	P. McMillan	S. R. J. Woods, D.S.C., R.D., Cdr. R.N.R., J. A. Molyneux, D. E. Milner	C. E. C. Crew ..	Cayzer, Irvine & Co., Ltd.

Clan Maclaren	GSSC	18.8.50	A. Redford, Capt. R.N.R.	L. Pitts, D. Richards, K. Morton	R. W. Moore	Cayzer, Irvine & Co., Ltd.
Clan Macnair	GFNK	14.7.50	J. P. Dumphy	R. Shattock, W. Keynon, M. Maciver	—. Dees	Cayzer, Irvine & Co., Ltd.
Clan Macneil	GFWP	18.4.50	J. West	G. Rowland, B. Edwards, A. P. Sweeny	A. Gordon	Cayzer, Irvine & Co., Ltd.
Clan Macrae	MAHP	7.3.49	E. Coulthart	J. D. W. Chapple, T. Aitchison, J. Nichols	W. Bryce	Cayzer, Irvine & Co., Ltd.
Clan Mactavish	GUBB		H. S. Pengelly	G. Owen, G. S. Russell, G. Dubery	W. A. Elmers	Cayzer, Irvine & Co., Ltd.
Clan Shaw	GBYW		R. P. Galer, C.B.E., R.D., Capt. R.N.R.	A. Tyrrell		Cayzer, Irvine & Co., Ltd.
Clan Urquhart	GFBK	17.4.50	T. W. Inman, O.B.E.	W. Graham, M. N. Ure, A. D. Rumble	A. F. McIntyre	Cayzer, Irvine & Co., Ltd.
Clearpool	MAHQ	14.6.50	J. Whamond	G. Ratcliffe, I. H. Isaac, A. Pringle	R. R. Bromham	Sir R. Ropner & Co., Ltd.
Clydebank	GKLM	22.5.50	J. E. Allen	B. H. Smith, A. R. Howson, E. A. D. Vargas	A. G. Roberts	Andrew Weir & Co., Ltd.
Clydefield	GSNK	28.7.49	A. S. Reid	P. B. Goudie, J. C. Wheeler	J. Layton	Hunting & Son, Ltd.
Columbia Star	GQGT	13.4.50	D. J. Stratta	F. C. T. Wood, D. E. Ortner, D. B. Wright, —. Gilmore	A. Etheridge	Blue Star Line, Ltd.
Comliebank	GKLJ	1.6.49	J. Townsley	A. J. Whiston, A. Brown, E. J. Stoddart	R. Holding	Andrew Weir & Co., Ltd.
Condesa	MAHU	19.6.50	H. Heal	R. Tinmouth, S. J. Edgington, M. Jenkins	J. S. Bishop	Furness-Houlder Argentine Lines, Ltd.
Consuelo	GCGQ	20.2.50	H. Greenhill	T. H. Lewis, G. Spooner, A. Robinson, N. Bilitch	J. R. Eastwood	Ellerman's Wilson Line, Ltd.
Corfu	GRNW	13.4.50	F. Ferraby	K. H. S. Renshaw, D. M. Johnstone, J. R. Neale, N. R. Lewis	J. T. Macdonald	P. & O. Steam Navigation Co.
Corinthic	GZYL	12.10.50	G. M. Robertson, D.S.C.	H. A. Howe, G. B. Broom, R. G. G. Adams, D. M. Mortimer	A. W. Allen	Shaw, Savill & Albion Co., Ltd.
Corrientes	GFPT	21.4.50	A. L. Hunter	R. Allen, R. Aitken, J. H. Stark	W. Vaughan	Donaldson Bros. & Black, Ltd.
Coulgorm	MAHZ	6.2.50	G. Robison	W. Birnie, P. McKellar, I. Cloherty	E. Yard	Lambert Bros., Ltd.
Craftsman	GPZT	17.4.50	W. F. O'Neill	W. E. Williams, I. M. Ritchie, J. Macaulay	R. J. Francis	T. & J. Harrison
Cumberland	GPPY	30.7.50	J. Oxnard	M. Heron, R. B. C. Brown, R. Gandy	W. Sykes	Federal Steam Navigation Co., Ltd.
Daleby	MFBV		J. Kenney			Ropner Shipping Co., Ltd.
Dallas City	GCLS	29.6.50	C. E. Exton	T. W. D. John, N. C. Pascoe, A. M. Robson	H. Christianson	Sir William Reardon Smith & Sons, Ltd.
Darro	MAID	30.12.49	T. Powell	J. Green, R. J. Kistler, J. C. Derby, J. S. Kent	J. B. Smith	Royal Mail Lines, Ltd.
Debrett	GRPR	18.10.50	W. Gillespie	H. M. Bunker, I. Pritchard, H. T. Cunliffe	W. Miller	Lamport & Holt Line, Ltd.
Deebank	GTDB	22.5.50	B. Rivett	G. T. Clarke, R. Clarke, J. A. North	A. A. Macpherson	Andrew Weir & Co., Ltd.
Delane	MMNW	11.1.49	H. Pratt	B. M. Metcalfe, L. J. Roberts, C. T. Skrastin, D. Simpson	J. Care	Lamport & Holt Line, Ltd.
Delilian	GJSQ	18.10.50	R. McNie	A. S. Kerr, A. T. Johnston, S. C. Macdonald	W. J. Read	Donaldson Bros. & Black, Ltd.
Delius	GZSY	5.10.49	A. W. Mitchell	W. Jones, A. Bennett, B. Walker, J. Garcia	R. Pryer	Lamport & Holt Line, Ltd.
Denbighshire	GQGW	22.8.50	J. Simpson	—. Heyward, T. White, —. Davies	G. Heapy	Glen Line, Ltd.
Derryclare	GCKN	20.7.50	N. Bellwood	M. W. Drew, J. Parish	F. B. Bowles	McCowen & Gross, Ltd.
Derryheen	MAIF		R. Storm			McCowen & Gross, Ltd.
Deseado	MAIH	3.4.50	S. J. G. Hill	N. J. Oliver, R. D. Jones, P. C. T. Davies	N. Roberts	Royal Mail Lines, Ltd.
Devis	GFKT	9.7.48	T. J. Sweeny	P. Casey, J. Bicknell, G. Trickey	J. Care	Lamport & Holt Line, Ltd.
Devon	GDRF	8.11.49	A. Hocken	R. Stewart-Scott, J. D. Cubitt, R. D. Baillie, J. D. Hellings	L. Carter	Federal Steam Navigation Co., Ltd.
Devonshire	GTTV	2.8.50	N. F. Fitch	B. McManus, P. R. De Witt, J. F. W. Farrow	G. Talbot	Bibby Bros. & Co.
Dilwara	GYQV	8.11.49	F. L. Sampson, D.S.C.	H. B. Cray, D. P. Hancock, P. S. Gardner	S. J. Taylor	British India Steam Nav. Co., Ltd.
Discovery II	GWVM		J. F. Blackburn, D.S.O., Cdr. R.N. (Retd.)			National Institute of Oceanography.
Dominion Monarch	GRGG	1.9.50	Sir Henry Gordon, K.B., D.S.C.	A. D. English, J. B. Hunt, C. C. D. Gough, S. H. Wilde, J. R. Sims	J. A. McAskill	Shaw, Savill & Albion Co., Ltd.
Dorelian	GJTL	5.12.49	D. MacQueen	A. J. Dougall, R. S. Hopkins, A. R. Nott	B. Kimble	Donaldson Bros. & Black, Ltd.
Doris Clunies	MSLB	1.7.50	A. MacVicar	J. B. Whyte, K. M. Hamilton, —. Eelloo	H. A. Reynolds	Clunies Shipping Co.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Drina	MAIL	20.9.49	D. R. Miller	C. A. Miller, M. Mortimer, J. H. Napper	A. Allen	Royal Mail Lines, Ltd.
Dromore	GDSF	20.9.49	J. R. Moreby	J. McCool, S. N. Coe, D. Beighton	R. H. Heard	Furness Withy & Co., Ltd.
Dryden	MQFT	28.9.49	F. A. Griffiths	K. Quirk, M. Fair, W. Overhill, M. J. McNeil	J. Gerrity	Lamport & Holt Line, Ltd.
Duke of Athens	GMYS	13.2.50	J. G. Lomas, A.I.N.A.	T. Walton, L. Labistour, J. G. Perrin, N. Beattie	D. R. Uglow	Trent Maritime Co., Ltd.
Dunedin Star	GKKT		J. C. W. Davies	R. R. Elliott		Blue Star Line, Ltd.
Dunkery Beacon	GUFS	14.11.49	L. E. Thomas	J. D. B. Wylie, A. J. Hawkes, D. W. Hobday	A. B. Ewart	Phs. Van Ommeren (London), Ltd.
Dunster Grange	GCSD	15.5.50	R. S. Grigg, O.B.E.	H. R. Neal, D. G. Bray, T. C. Mullings	T. Jones	Houlder Bros. & Co. Ltd.
Durango	MAIM	8.5.50	P. M. Burrell	T. Buckney, J. Pastill, R. Sly, J. Gunns, L. L. Hunter	W. Wilson	Royal Mail Lines, Ltd.
Durban Castle	GPGP	1.5.50	G. W. B. Lloyd	W. Reilley, —. Cutcliffe, D. A. Bird	H. A. Liggins	Union Castle Mail S.S.Co., Ltd.
Durenda	GFSL	18.3.50	R. Stone	H. R. Smith, G. Whitlam, —. Hargreaves	—. Wigglesworth	British India Steam Nav. Co., Ltd.
Durham	GWWK	8.5.50	R. J. Dunning	B. Applegate, J. T. Pettie, J. A. Edmondson, D. Hilliard	C. Robinson	Federal Steam Navigation Co., Ltd.
Eastern	GFTV	28.3.49	H. C. G. Stratford	D. Simon, D. Elkington, D. Grant	E. C. Bouel	Eastern & Australian S.S. Co., Ltd.
Edinburgh Castle	GOHN	17.4.50	T. W. McAllen	R. W. Mitten, I. C. McPherson, —. Gray	J. Hodgson	Union Castle Mail S.S. Co., Ltd.
Edward East	GYXZ		J. A. Whittleton			H. Croft Baker & Sons, Ltd.
Egidia	GJZD		J. L. Gibson, O.B.E.	W. B. Sawyers, W. Hallum, R. Watt, H. Keenan	R. Hartley	Anchor Line, Ltd.
El Gallo	MAIP	24.4.50	S. J. Watts	T. Pearson, E. J. Morgan, J. Channing-Pearce	A. G. Pews	C. T. Bowring & Co., Ltd.
Elysia	GJZK	8.7.50	D. Barclay	J. C. McLarty, J. T. Donald, A. McKendrick, N. M. Fletcher	W. H. Hier	Anchor Line, Ltd.
Empire Brent	GLBX	8.7.50	J. Cook	H. Tomson, N. Dalziel, S. P. Ewing	L. Hooper	Donaldson Bros. & Black, Ltd.
Empire Fowey	GMFW		D. G. Bailey	P. C. Reed, R. W. Eleanor, —. Lightbody, J. Howton	P. Maloney	P. & O. Steam Navigation Co.
Empire Halladale	GPVQ	6.3.50	J. McGill Brown	G. Ramage, W. G. Creelman, W. Marshall	D. Robson	Anchor Line, Ltd.
Empire Martaban	GBSV	1.7.50	E. Pleasance	W. Mottram, S. McGillivray, J. Lewis	R. Charlton	Bolton S.S. Co., Ltd.
Empire Orwell	GRCB		A. C. G. Hawker, C.B.E., R.D., R.N.R.	P. J. C. Cockburn, J. R. English, P. Byers	A. C. Shippam	Orient Steam Navigation Co., Ltd.
Empire Patrai	GDKL	5.8.49	C. L. Thomas	M. Uminsky	G. R. Stuart	Fenton S.S. Co., Ltd.
Empire Pride	MAJB	24.7.50	A. Williamson	J. G. Sleight, R. Hammond, B. Penington	A. Mallett	Bibby Bros. & Co.
Empire Star	GCDP	28.10.49	G. E. Barnard	T. Hender, M. R. Bremberg, J. Edwards, P. Ellett	H. Smith	Blue Star Line, Ltd.
Empire Viceroy	MAJN	8.7.50	J. B. S. Bland	—. Brockwell, —. Brydges, —. Crossley	—. Hagon	Pandelis Shipping Co., Ltd.
Empress of Australia	GFSB	15.12.48	S. W. Keay, O.B.E.	W. J. P. Roberts, R.D., R.N.R., A. G. Ingram, J. E. Potter, M. H. Scott	W. Campbell	Canadian Pacific S.S., Ltd.
Empress of Canada	GSVR	28.11.49	J. P. Dobson, D.S.C., R.D., R.N.R.	A. H. R. Peace, R. Walgate, J. H. Fraser, B. Snell, J. P. Jones	J. M. Butterworth	Canadian Pacific S.S., Ltd.
Empress of France	GNTV	7.12.49	C. E. Duggan, R.N.R.	J. M. Brackenridge, R. G. Roberts, F. Surtees, J. C. Moffat	D. Murphy	Canadian Pacific S.S., Ltd.
Empress of Scotland	GMLV		E. A. Shergold	J. Richardson, J. Martin		Canadian Pacific S.S., Ltd.
Erodona	GZLQ		J. E. Gill			Anglo-Saxon Petroleum Co., Ltd.
Eros	GYSB	2.6.50	R. C. Vigurs	V. Irving, C. P. Turquand, H. Beyer, W. King	P. McEwan	Elder & Fyffes, Ltd.

Esperance Bay ..	GSMP	1.7.50	T. V. Roberts, R.D., Capt. R.N.R.	G. S. Sheldon, G. Main, J. D. Rendle, J. K. Wyles	M. J. Sheehan ..	Shaw, Savill & Albion Co., Ltd.
Essex Trader ..	GCMS	18.8.50	D. G. Evans	D. Owen, F. Stamps, D. Harris	R. Moore	Trader Navigation Co., Ltd.
Esso Edinburgh ..	GCQM	19.4.50	M. Rutherford	J. Leech, J. C. Young, D. Turtle ..	W. Whittaker ..	Esso Transportation Co., Ltd.
Esso Glasgow ..	GTXC	20.10.50	D. J. Davies	R. J. Davies, A. Campbell, E. Shelton-Jones	P. J. Everett ..	Esso Transportation Co., Ltd.
Esso Plymouth ..	GYRX	20.4.50	O. H. Shepheard	A. Lindall, J. Marks, I. Mackintosh ..	R. Lowen	Esso Transporattion Co., Ltd.
Explorer	GYJX	29.3.50	J. L. Curle	W. C. Johnstone, H. Cowley, W. C. T. Pennant	B. Tallon	T. & J. Harrison
Fanad Head	GNQQ	14.3.50	W. A. Haddock	J. McCauley, R. Harris, A. Davies ..	J. J. Dunne	G. Heyn & Sons, Ltd.
Fordsdale	GSMW	14.6.50	T. T. Oliver	H. B. Moss, K. Murray-Brown, D. A. C. Adams	H. Knight	Shaw, Savill & Albion Co., Ltd.
Fort Spokane ..	MXLY	8.5.50	W. T. Fitzgerald, R.D., R.N.R.	H. D. Carmichael, T. D. Ridley, D. A. Davies	H. M. Bursen ..	Cunard Steamship Co., Ltd.
Franconia	GBRQ	1.7.50	J. A. Myles, R.D., R.N.R. ..	P. Walton, I. S. Roe, T. O'Sullivan ..	J. L. Blanchard ..	Cunard Steamship Co., Ltd.
Fresno City	GBYD	16.1.50	W. V. Doughty	A. B. Parkhouse, W. P. Davis, P. C. W. Power	T. H. Owen Ffoulkes	Sir William Reardon Smith & Sons, Ltd.
Fylingdale	GKSR	20.2.50	R. Coultas	W. W. Gateby, N. Jameson	J. Ellis	Headlam & Son
Geologist	GJMR	19.6.50	A. E. Jackson	S. Richardson, R. H. Douglas, P. B. Dilleigh	M. H. Whitehead ..	T. & J. Harrison
Georgic	GRLJ	28.9.49	C. S. Williams	G. H. Drinkwater, A. R. M. Graham, T. O'Sullivan, F. Watt	A. G. Hill	Cunard Steamship Co., Ltd.
Glaucus	GDYZ	31.12.47	W. L. Anderson	R. G. Edwards, F. A. S. Millar, G. L. Davies	E. Roberts	A. Holt & Co.
Glenaffaric	GDPS	1.7.50	H. S. Wood	J. T. Jenkins, E. T. J. Hill, G. W. Lane, J. F. Pilling	D. C. Traverse ..	Glen Line, Ltd.
Glenartney	GBLG	24.4.50	C. J. Tyler	I. H. Browning, A. H. Ferguson, M. MacFarlane	F. Wilson	Glen Line, Ltd.
Glenbank	GKLC	7.12.48	T. Fraser	W. Murphy, D. V. Hoskins	W. Lingbottom ..	Andrew Weir & Co., Ltd.
Glenorchy	GBLL	22.8.50	P. Cross	F. D. Glover, G. Pari-Hews, P. C. Ross ..	L. A. Tebbutt ..	Glen Line, Ltd.
Gloucester	MANK	8.5.50	N. L. Warren	F. C. Taylor, G. W. Wotton, J. Marshall	T. Herbert	Federal Steam Navigation Co., Ltd.
Golfito	GBYL		S. A. Sapsworth	R. A. Laycock, J. H. Payne, J. B. Hughes	R. W. Smith ..	Elders & Fyffes, Ltd.
Gracia	MANN	14.9.50	J. McInnes	D. N. Allan, G. B. Manson, I. D. Barbour	E. Wrightson ..	Donaldson Bros. & Black, Ltd.
Granford	MQGC		E. C. J. Morgan	J. Gray, H. Schmuul, W. Harris ..		Goulandris Bros., Ltd.
Haparangi	GJYX	29.6.50	C. R. Pilcher	J. R. Ramsay, C. Burrill, R. S. Luly, E. Cooper	A. Williams	New Zealand Shipping Co., Ltd.
Harmatris	GTWP	4.8.50	A. R. Phelps	G. S. Robinson, A. H. Barber, J. R. Morford	P. Corbishley ..	J. & C. Harrison, Ltd.
Helicina	GKBC	8.9.50	D. T. Keddie	H. W. Gostage, E. C. Barnes, J. B. Walker	M. O. R. Lynch ..	Anglo-Saxon Petroleum Co., Ltd.
Herdsman	GPZX		W. A. Short, O.B.E. ..	J. W. Embleton, K. Cobb, J. Cubbin ..	I. Donald	T. & J. Harrison
Herefordshire ..	GOFG	18.8.50	G. Dobson	H. Knapper, J. W. MacKinlay, K. Allen ..	F. W. Greaves ..	Bibby Bros. & Co.
Highland Brigade ..	GJKN	6.2.50	A. N. Anderson	D. V. Buckle, D. N. G. East, L. H. Paine	W. Gay	Royal Mail Lines, Ltd.
Highland Chieftain ..	GCTY	22.5.50	W. H. Grimshaw, O.B.E. ..	M. Wardle, R. M. Box, R. D. H. Manley, J. M. C. McLaughlin, C. J. S. Morris ..	W. Rolonson ..	Royal Mail Lines, Ltd.
Highland Monarch ..	GMZF	16.9.50	B. C. Dodds, O.B.E. ..	N. Lawson, C. B. Lambert, R. L. Collins, R. M. Tysoe	F. Dunk	Royal Mail Lines, Ltd.
Highland Princess ..	GFMN	7.10.49	W. Roberts	J. Anderson, W. M. Morton	F. Goodall	Royal Mail Lines, Ltd.
Hilary	GQVM	18.8.50	J. W. Binns, O.B.E. ..	T. McMullan, A. C. P. Murray	T. Tyman	Booth S.S. Co., Ltd.
Himalaya	MCDY	4.4.50	H. C. C. Forsyth, R.D., Cmde. R.N.R.	G. C. Barrett, G. B. Thom, E. A. W. Mortleman-Lewis, R.D., R.N.R. ..	F. E. Ash	P. & O. Steam Navigation Co. New Zealand Shipping Co., Ltd.
Hinakura	GDVS		E. A. J. Williams			
Hororata	MANZ	22.5.50	E. H. Hopkins	W. Stevens, A. H. Sims, G. Munson, B. Hewitt	D. E. Hodding ..	New Zealand Shipping Co., Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Hubert	GFNW	23.6.49	J. Whayman, D.S.C., R.D., R.N.R.	T. E. Williams, D.S.C., R.D., Lt.-Cdr. R.N.R., K. Grayson, R. Soulsby	D. Swindon	Booth S.S. Co., Ltd.
Huntingdon	GFCT		H. J. Angell			Federal Steam Navigation Co., Ltd.
Hurunui	GJZF	1.7.50	H. E. Reilly, R.D., R.N.R.	G. Naylor, R. Baker, J. Milner	W. Sykes	New Zealand Shipping Co., Ltd.
Inishowen Head	MAOC	20.2.50	J. Clarke	N. C. Stark, C. O'Conner, I. Pigott	J. J. Dunne	G. Heyn & Sons, Ltd.
Interpreter	GPZY		H. Coates	W. E. Owen, I. Mitchell		T. & J. Harrison
Inverbank	GKML	21.7.49	A. F. King	G. Cheyne, A. Teale, A. Findlay	S. Dewsnap	Andrew Weir & Co., Ltd.
Jamaica Producer	VPLM	3.1.50	G. M. Jenkins	E. G. J. Roberts, J. A. Whitehouse, P. R. K. Davis	A. C. Webb	Kaye Son & Co., Ltd.
Jersey City	GIGA	2.8.50	D. W. Boutcher	G. Harvey, J. Groves, R. Goatley	R. Jelley	Sir William Reardon Smith & Sons, Ltd.
Jessmore	MAOF	5.6.50	G. Killick	P. V. McCullough, R. Martin, R. W. Liley	F. Matthews	Furness Withy & Co., Ltd.
John Biscoe	VPNE	27.7.50	W. Johnston			Government of the Falkland Islands
John Holt	GNFD	12.10.49	J. Shaw	P. Bathurst, W. L. Harrison, R. J. Griffiths	P. A. Senior	John Holt Line, Ltd.
Kaikoura	GZPZ		N. Fraser	G. S. Gunn		Trinder, Anderson & Co.
Kaipaki	GQGJ	24.4.50	T. M. Fenwick	J. Farrell, J. B. Ricketts, F. Le Messurier	A. Leeder	Trinder, Anderson & Co.
Kaipara	GZPY	16.12.49	G. P. Parkinson, O.B.E.	D. M. Steven, N. Stirzaker, A. E. Carter	R. M. Evans	Trinder, Anderson & Co.
Kaituna	GQGG	20.6.50	R. F. Hellings	T. G. Wilson, J. Jackson, G. Charleson	A. Clegg	Trinder, Anderson & Co.
Kenilworth Castle	MQLP	24.2.49	L. H. Farrow	D. B. Ross, J. H. Drummond, I. Bigham	C. Robinson	Union Castle Mail S.S. Co., Ltd.
Kent	GPDC	18.7.50	N. A. Thomas	J. Collins, R. Kinloch, M. Blake	R. Heath	Federal Steam Navigation Co., Ltd.
King Robert	MAON	12.8.50	G. Craze	W. Keith, G. Griffiths, P. Kidd	W. Fielding	King Line, Ltd.
King William	GNVF	18.7.50	A. B. Drever	J. C. Davies, P. M. Flower, D. Evans	A. McInnes	King Line, Ltd.
Kohistan	GSFZ	29.6.50	A. N. Henderson	W. G. Smith, —. Jones, J. Dixon	D. Chapman	F. C. Strick & Co., Ltd.
Laguna	GJKC	20.9.49	R. D. S. Eckford	R. H. Scaiff, W. Johnston, G. McIntyre	K. W. Baddeley	Pacific Steam Navigation Co.
Lambrook	MAOS	4.4.50	H. F. McInnes	J. Orr, R. G. C. Gibson	J. J. Brennan	Gallbraith Pembroke & Co., Ltd.
Lanarkshire	GCTC	18.8.50	A. R. Cossar	L. Pogson, A. A. Elston, D. MacMillan	G. J. Ingram	Turnbull, Martin & Co., Ltd.
Lancashire	GLZC	15.5.50	E. W. Jeffries	W. H. Malley, H. Treasurer, O. R. T. Ashcroft	A. Jones	Bibby Bros. & Co.
Lassell	GFND	1.6.49	J. King	S. Dickenson, K. Horne, P. V. des Landes	N. Moore	Lamport & Holt Line, Ltd.
Latia	GLCF	12.10.49	J. B. Ritchie	A. P. S. Jackson, N. Morganti, R. J. Stanley	J. Brownlee	Anglo-Saxon Petroleum Co., Ltd.
Levernbank	GLPZ	8.7.50	D. Gillies	G. Cheyne, R. Lidstone, D. Moore	A. P. J. Brooke	Andrew Weir & Co., Ltd.
Linguist	GQBC	4.8.50	A. H. Frew	C. S. S. Boam, K. E. Pritchard, J. Tranfield	R. Moss	T. & J. Harrison
Livorno	GPWF	1.6.48	E. S. Green	F. Methan, J. Williams, J. Beer	K. W. Baddeley	Ellerman's Wilson Line, Ltd.
Llangibby Castle	GPLV	16.11.49	D. D. Mackenzie	D. Leitch	J. Eager	Union-Castle Mail S.S. Co., Ltd.
Lloydcrest	MAOY	12.10.50	H. R. Knight	H. W. Campbell, R. Thompson	W. Fitzpatrick	Crest Shipping Co., Ltd.
Lobos	GDXL	25.2.49	P. Ray	J. H. Allenby, F. Hutchings, R. Pass	E. Fisher	Pacific Steam Navigation Co.
Loch Avon	GMZT	8.7.50	A. N. Anderson	G. E. Leech, D.S.C., D. R. Bryden, I. Jamieson	M. R. Littlejohn	Royal Mail Lines, Ltd.
Loch Garth	GMZY	17.11.49	J. Smith, R.D., R.N.R.	E. A. E. Littlewood, J. N. Kavanagh, A. Hanily, M. Dean	D. Morgan	Royal Mail Lines, Ltd.
Loch Ryan	MAOZ	22.11.49	R. N. Fletcher	T. Evans, R. C. Hunnisett, H. Nixon, C. Cowley	J. F. G. Thomas	Royal Mail Lines, Ltd.
Lord Gladstone	MAPA	4.3.49	P. S. Kenning	A. H. Treikelder, J. Janezak, J. S. Armstrong	J. Saidler	Ships Finance & Management Co., Ltd.
Loriga	GCLM	4.3.50	S. E. Ayland	A. S. Maclean, R. Dootson, W. R. Goldie	J. Murray	Pacific Steam Navigation Co.
Losada	GDXM	29.7.49	D. W. Hutchinson	F. J. Leicester, W. Jenkins, A. H. Smith	E. O'Neill	Pacific Steam Navigation Co.
Luminous	MAPB	20.6.49	S. Weatherston	A. W. Banks, R. M. Chalmers	D. Whiteling	H. E. Moss & Co.
Macharda	GKKF	19.6.50	R. A. Penston	—. Dobson, L. J. E. Saxty, J. Robertson	J. Caddy	T. & J. Brocklebank, Ltd.

Magdapur	GBJX	6.2.50	A. Hill, O.B.E.	H. Ackerley, L. Burn, G. Kay	H. Halton	T. & J. Brocklebank, Ltd.
Mahanada	GOFM	4.1.49	J. W. B. Robertson, R.D., R.N.R.	J. Brand, J. C. Long, P. Greenall, G. P. Hurns	T. Williams	T. & J. Brocklebank, Ltd.
Mahia	GNZV	1.3.50	G. Campbell	R. F. Hamilton, N. E. Wood, D. M. Heynes	F. Jones	Shaw, Savill & Albion Co., Ltd.
Mahout	GDZN	22.5.50	H. F. Scoins	D. L. Campbell, E. G. Anderson, H. L. Burn	C. W. Jacobs	T. & J. Brocklebank, Ltd.
Mahseer	GZSV	5.6.50	L. T. Owen, O.B.E.	D. Carter, F. Mitchell, A. Halcrow	R. Burton	T. & J. Brocklebank, Ltd.
Mahsud	GSCP	6.9.49	L. E. Jeans	J. W. Ross, J. H. Moore, G. H. Hunter	B. Pinn	T. & J. Brocklebank, Ltd.
Maihar	GSCL	13.4.50	W. Gibson	O. Pritchard, F. Mitchell, P. A. Gunson	F. C. Bailey	T. & J. Brocklebank, Ltd.
Makalla	GOFN	14.6.50	T. C. Eddy	D. H. Morris, E. Watkins, J. K. Cooper	G. Caddy	T. & J. Brocklebank, Ltd.
Malakand	GOFP	29.7.50	H. G. Allan	J. P. Jackson, A. B. Davies, K. R. Hughes	A. E. Weston	T. & J. Brocklebank, Ltd.
Malancha	GZRD	9.9.49	S. Broughton	J. Clarke, J. R. Kemp, D. J. Evans	B. J. Smith, M.B.E.	T. & J. Brocklebank, Ltd.
Malmesbury	MAQE	29.6.50	R. Ross	W. P. Russell, H. E. Barratt, E. Cole	D. Flood	Houlder Bros. & Co., Ltd.
Maloja	GFBD	8.9.50	E. J. Parry	R. M. Sinclair, J. C. Jenkins, —. Rimmer, M. R. Learner	W. Dawson	P. & O. Steam Navigation Co.
Manchester City	GBBP	6.4.50	H. Hancock	W. Hine, R. Wadsworth, R. O. White, J. S. Ellis	A. S. J. Broadbent	Manchester Liners, Ltd.
Manchester Division	GBYR	2.6.50	M. E. Bewley	M. F. Robinson, D. Millard, T. H. Lynn	R. S. Pogson	Manchester Liners, Ltd.
Manchester Port	GYNF	10.1.50	F. Downing	J. E. Jones, J. S. Dalgarno, T. Field, A. H. Swan	P. B. McNab	Manchester Liners, Ltd.
Manchester Progress	GPGD	12.10.50	E. W. Espley	F. Lewis, L. C. Taylor, N. W. Cockshoot	W. H. Critchley	Manchester Liners, Ltd.
Manchester Regiment	GBRD	19.10.49	F. D. Struss, O.B.E., D.S.C.	W. R. McLaren, J. E. Askew, A. Swan	A. Reid	Manchester Liners, Ltd.
Manchester Shipper	MAPC	14.1.47	E. W. Raper	F. Lewis, D. Heaton, T. H. Lynn	E. Ambler	Manchester Liners, Ltd.
Manchester Trader	GMWG	12.1.49	M. E. Bewley	W. E. Oliver, P. N. Fielding, A. C. Caird, N. Cockshoot	A. C. Gavin	Manchester Liners, Ltd.
Mandasor	GBNY	8.11.49	R. Humble	D. A. Keller, A. W. Wiltshire, P. Manson	G. W. Hazel	T. & J. Brocklebank, Ltd.
Marengo	GLFW	3.3.50	F. Ellison	H. Edwards, H. Riley, C. Main	G. Camm	Ellerman's Wilson Line, Ltd.
Margay	GFYQ	22.5.50	E. A. Prentice	A. J. Thompson, B. S. Kenn, K. Cooper	L. L. Lithgow	Kaye, Son & Co., Ltd.
Markhor	GTFZ	7.2.49	J. B. Newman	I. A. MacLaren, J. Ritchie, —. Woodward	D. Owen	T. & J. Brocklebank, Ltd.
Marna	MLPK	14.6.50	R. J. Sinclair	I. C. Macdonald, A. Petrie	R. J. Sinclair	Chr. Salvesen & Co.
Marsdale	GBKB	18.10.50	M. Ferguson	—. Webster, T. Scales, J. Bennet	T. Slattery	Kaye, Son & Co., Ltd.
Martand	GTGG	18.10.50	J. Fox-Lloyd	H. Defty, P. N. Bonny, J. Robertson	D. H. Butterworth	T. & J. Brocklebank, Ltd.
Martita	GNQT	21.12.49	H. Bunn	M. G. Stevens, H. R. Watson, D. Johnston	D. Diver	Kaye, Son & Co., Ltd.
Mataroa	GCSV	15.5.50	R. G. James, R.D., Capt. R.N.R.	J. Williams, P. Carden, R. Ryding	L. Boyce	Shaw, Savill & Albion Co., Ltd.
Matheran	GOFQ	18.9.50	H. McGregor	H. Simpson, J. A. Miller, R. F. Holland	P. Neeson	T. & J. Brocklebank, Ltd.
Matina	GSZX	29.6.50	H. Roberts, O.B.E.	W. F. Young, E. Whitehouse, R. L. Leech	D. Knights	Elders & Fyffes, Ltd.
Mauretania	GTTM	12.12.49	C. Ivan Thompson	M. B. Cox, O. F. Elsom, J. Ward	F. Clarke	Cunard Steamship Co., Ltd.
Media	GSWR	20.7.50	D. M. MacLean, D.S.C., R.D., R.N.R.	R. G. Hunt, J. O. Springall, R.D., R.N.R., R. Hardman	J. MacArdle, M.B.E.	Cunard Steamship Co., Ltd.
Melbourne Star	GDFZ	6.2.50	F. N. Riley, D.S.O.	R. G. Taylor, D. S. Gilmour, D. A. R. James	J. Clarke	Blue Star Line, Ltd.
Millais	MAPH	14.10.49	A. R. Bibby, O.B.E.	J. Edgar, D. S. Leicester, A. B. Baines	J. Williams	Lamport & Holt Line, Ltd.
Mirror	GDFL	8.7.50	S. P. Sheldon	P. A. J. Edwards, G. W. Heron, J. Willmer	J. Crouch	Cable & Wireless, Ltd.
Monarch	GBDF	5.12.49	J. P. F. Betson	R. M. Tuckwell, R. H. Hardy, R. A. Evans	D. Rendall	H.M. Postmaster General
Mooltan	GFBC	2.6.50	C. E. Pollit	J. W. Owen, L. H. Kellett, E. M. Phelps	J. Ormiston	P. & O. Steam Navigation Co.
Moveria	GKYW	12.2.49	J. Jack	G. Waddle, A. Henderson, W. McKean	H. D. Robinson	Donaldson Bros. & Black, Ltd.
Mulbera	GFTM		D. J. B. Barling	P. M. Pitcairn		British India Steam Nav. Co., Ltd
Myrtlebank	GLQB	1.3.50	F. Hale	P. A. Logan, A. Cockburn, I. S. Currie	N. Kehoe	Andrew Weir & Co., Ltd.
Napier Star	MAPN	24.7.50	M. Tallack			Blue Star Line, Ltd.
Naticina	GIGH	4.1.49	F. Mansfield	P. Kendall, M. Goddard, L. Stephens	J. E. Conway	Anglo-Saxon Petroleum Co., Ltd.
Neaera	MQTG		R. G. Green	V. Graham		Anglo-Saxon Petroleum Co., Ltd.
New Australia	GZKD		D. Aitchison	Wm. Newport		Shaw, Savill & Albion Co., Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
New Zealand Star	GYCR	26.11.49	G. Owen, O.B.E., R.D., Cdr. R.N.R.	R. Stewart, J. G. Reeve, P. Brecknell	C. J. Carter	Blue Star Line, Ltd.
Newfoundland	GNMC	19.1.50	C. H. Kenyon	J. B. Stewart, J. T. Sheffield, D. Beighton, R. B. Douglas	T. Cahill	Furness, Withy & Co., Ltd.
Norfolk	GJLV	20.8.49	B. Evans	R. Harding, E. Worster, J. Witchell, J. Gardyne	—. Wilman	Federal Steam Navigation Co., Ltd.
Northumberland	GBSJ	13.4.50	L. W. Fulcher	J. M. James, P. N. Jeanes, T. G. Fuller	R. N. MacDonald	Federal Steam Navigation Co., Ltd.
Norwegian	GDMC	24.3.50	C. S. Low	D. K. Dickson, J. Hunter, G. Clarke	H. T. Hammer	Donaldson Bros. & Black, Ltd.
Nottingham	GCNC		H. D. Horwood, R.D., Cdr. R.N.R.			Federal Steam Navigation Co., Ltd.
Nova Scotia	GNNK	22.5.50	J. L. Anson, O.B.E.	J. D. P. Williamson, R. Heys, J. Williams	W. C. Brock	Furness, Withy & Co., Ltd.
Novelist	GMLG	10.1.50	T. E. Steele	D. O. Percy, G. B. Roberts, G. K. Watson, T. Maddox	T. Timmons	T. & J. Harrison
Orari	GJKX	25.4.50	F. Lougheed	E. White, A. A. Faulkner, W. Dawes	J. K. Brindlewood	New Zealand Shipping Co., Ltd.
Orcades	MABA	22.9.50	I. E. G. Goldsworthy, R.D., R.N.R.	O. F. W. Pitts, L. A. Finch, G. D. Fletcher	N. A. Boon	Orient Steam Navigation Co ., Ltd.
Orduna	GLTS	12.12.49	J. Williams	T. Wilcockson, L. Seddon, J. Owen	J. Clarke	Pacific Steam Navigation Co.
Orion	GYKL	15.5.50	N. A. Whinfield	M. R. Wilmshurst, P. Leighton, D. P. Blois	T. H. Shannon	Orient Steam Navigation Co., Ltd.
Ormonde	GLYC	19.6.50	C. K. Blake, O.B.E.	J. K. Thornton, E. V. Harris, J. S. Gregson	R. Oakley	Orient Steam Navigation Co., Ltd.
Orontes	GBXM	3.8.50	S. S. Bernand, O.B.E.	R. F. Underwood, F. W. Woolley, D. Hays	F. Murphy	Orient Steam Navigation Co., Ltd.
Otranto	GFKV	16.1.50	R. J. Galpin, R.D., R.N.R.	J. W. Terry, C. S. Thomas, —. Francis, R. L. Clark	C. J. Seaton	Orient Steam Navigation Co., Ltd.
Pacific Exporter	GBJC	14.6.50	G. Brown	R. E. G. Simmons, R. G. G. Bonney, D. C. Aitchison	A. Cory	Furness, Withy & Co., Ltd.
Pacific Fortune	GBFM	26.8.50	E. O. Evans	J. Whitby, —. Sturt, —. Willoughby	—. Thomas	Furness, Withy & Co., Ltd.
Pacific Importer	GDKV	18.8.50	B. M. Collard	G. Cook, A. H. Linden, E. H. Gregson	W. Britton	Furness, Withy & Co., Ltd.
Pacific Liberty	GDFQ	27.7.50	W. Swann	J. Ferres, N. Land, C. Stiff	R. Faulkner	Furness, Withy & Co., Ltd.
Pacific Nomad	GCRZ	1.8.50	W. Hutchinson	J. J. Meacham, J. T. Cameron, E. B. Pratt	A. Adamson	Furness, Withy & Co., Ltd.
Pacific Stronghold	GNSQ	8.7.50	F. H. Perry	I. H. Clarke, D. R. Gibson, R. W. Keene, R. Hughes	S. A. Vincent	Furness, Withy & Co., Ltd.
Pacific Unity	GUAN	20.2.50	H. S. Reavley, O.B.E.	M. Head, J. Purrier, E. McG. Hall	P. Allison	Furness, Withy & Co., Ltd.
Palacio	GNJW	22.3.50	J. P. Harris	J. Sheppard, T. D. L. Platt, Lt.-Cdr., D.S.O., R.N.R., E. Pepper, A. E. Smith	T. A. Robinson	MacAndrews & Co., Ltd.
Palana	MMBF	6.3.50	F. R. Spurr	—. Savage, —. Trower, G. E. Harris	H. Olding	P. & O. Steam Navigation Co.
Palomares	GJGN	19.1.50	D. J. Thomas, M.B.E.	R. D. Cookman, W. T. Munday	M. F. Conroy	MacAndrews & Co., Ltd.
Pampas	GCDL	22.3.50	R. C. S. Woolley, R.D., R.N.R.	J. Allason-Jones, J. A. Martin, B. Sugden	J. Tuck	Royal Mail Lines, Ltd.
Papanui	GDJW	18.8.50	H. N. Lawson, R.D., R.N.R.	B. E. Crust, M. R. Forcer, J. D. Ekins	D. Roberts	New Zealand Shipping Co., Ltd.
Paparoa	GBCZ	20.9.50	N. Thomas	J. D. Cubitt, F. I. Christall, D. A. Williams	A. B. Mowatt	New Zealand Shipping Co., Ltd.
Paraguay	MAQS	31.1.50	H. V. Todd, R.D., R.N.R.	G. A. Gibbons, D. Davies, J. C. Cotton	P. Goulden	Royal Mail Lines, Ltd.
Pardo	GMNZ	1.9.50	T. Stephens	M. B. Wingate, G. Dudley, J. G. Lenfesty	P. Wadhams	Royal Mail Lines, Ltd.
Parima	GCLQ	21.3.49	H. E. Sang	J. T. Jones, J. M. Barber	N. H. Crocker	Royal Mail Lines, Ltd.
Paringa	MMBD	12.8.50	H. P. Mallet	P. C. Reed, R. Elenor, C. B. Thompson	B. S. Magennis	P. & O. Steam Navigation Co.
Parthia	GSWQ	4.8.50	C. B. Osborne, R.D., R.N.R.	G. D. Williams, P. S. Taylor, R. J. Ogilvie	A. O'Sullivan	Cunard Steamship Co., Ltd.
Perim	GCGB	7.10.49	J. M. Peter	P. J. Jackson, P. Hewitt, C. W. Lyon	F. Groves	P. & O. Steam Navigation Co.
Perthshire	GYWK	4.4.50	A. J. Hogg	G. Black, M. P. R. Turner, G. Sharp	F. Rayner	Turnbull, Martin & Co., Ltd.
Philomel	GYPV	18.10.50	H. M. Selmar	D. C. Diggins, —. Agnew, W. A. Devine	T. Milnes	General Steam Navigation Co., Ltd

Philosopher	MAQV	13.10.50	T. Winstanley	R. Hill, M. Watson, R. A. Patmore	W. C. Doyle	T. & J. Harrison
Pilcomayo	GBZX	15.5.50	F. A. C. Thacker	W. Kennedy, E. O'Keefe, K. Harper	E. Jones	Royal Mail Lines, Ltd.
Pipiriki	GDRQ	29.6.50	H. R. M. Smith	R. W. Merry, D. G. Seward, C. A. Miller	L. P. Sayer	New Zealand Shipping Co., Ltd.
Polar Maid	MAQX	14.6.50	J. T. Leask	E. D. Smith, T. Gilmour, R. Marshall	W. Tulloch	Chr. Salvesen & Co.
Port Auckland	GWRB		W. G. Enright, O.B.E., Cdr. R.N.R.			Port Line, Ltd.
Port Brisbane	GWRC	8.8.50	H. Steele	G. K. Morris, P. Smith, R. J. King	J. Griffiths	Port Line, Ltd.
Port Chalmers	GWQR	14.6.50	H. W. Hazlewood	A. W. Kensett, D. J. A. Pritchard, C. Milne	E. G. Gunner	Port Line, Ltd.
Port Hobart	GKGC	9.5.50	L. Copeland	A. J. Braund, E. Newstead, L. Garnham	B. Morley-Evans	Port Line, Ltd.
Port Jackson	GZKR	19.6.50	P. S. Ball	W. J. Williams, K. H. Henneker, D. Sinclair	R. C. Crompton	Port Line, Ltd.
Port Lincoln	GFZK	1.7.50	L. Copeland	H. Thompson, —. Webster, A. J. Wardell	P. J. McKeon	Port Line, Ltd.
Port Macquarie	MAQY	29.8.50	H. B. C. Clinch	T. A. Smith, J. E. Lascelles, G. A. J. Balfour	R. Robertson	Port Line, Ltd.
Port Napier	GPKD		G. W. Hazlewood	S. D. A. Pritchard		Port Line, Ltd.
Port Phillip	MAQZ	2.6.50	J. G. Lewis, O.B.E.	T. G. Ward, R. A. Holmes	B. MacGovern	Port Line, Ltd.
Port Pirie	GLVQ	12.10.50	F. W. Bailey, M.B.E.	J. T. Owen, P. G. Henneker, W. A. Wakefield	W. Miller	Port Line, Ltd.
Port Vindex	MAUW		H. H. Smith, O.B.E.	D. N. Robinson, G. Ballinger, J. R. King		Port Line, Ltd.
Port Wellington	GDNJ	14.3.50	E. J. Syvret	C. A. Rhodes, W. E. Bell, G. A. Blundell	J. S. McPherson	Port Line, Ltd.
Port Wyndham	GYCW	2.6.50	E. E. Roswell	P. R. Lewis, M. E. Field, W. M. G. Lloyd	J. N. Coutts	Port Line, Ltd.
Potaro	GNLJ	16.11.49	G. H. Taggart	M. Mortimer, R. R. Thompson, J. T. Price	T. J. Berry	Royal Mail Lines, Ltd.
Pretoria Castle	GOAE	23.1.50	R. Wren, D.S.O.	J. Kerr, —. Wetts, —. Trayner	H. Oliver, M.B.E.	Union-Castle Mail S.S. Co., Ltd.
Radley	GZZG	2.5.50	C. J. Forster	H. G. Strickland, D. A. Barfoot, J. D. Todd	P. Probert	Stephens, Sutton, Ltd.
Rakaia	GFGW	30.9.49	A. I. Robertson, R.D., R.N.R.	J. Bury, T. Wadie, J. Wright	F. Ratley	New Zealand Shipping Co., Ltd.
Ramore Head	MAXX	18.8.50	E. W. Black, O.B.E.	I. M. Piggott, N. C. Stark, C. E. Pringle	B. P. Lewis	G. Heyn & Sons, Ltd.
Ranchi	GLKW	18.1.49	A. G. Jenkins	E. R. Rose, J. Clayton, P. W. Holmes, D. Lightly	R. V. Gregory	P. & O. Steam Navigation Co.
Rangitane	GDBV		T. L. Maltby	F. S. Angus	C. Lambe	New Zealand Shipping Co., Ltd.
Rangitata	GSZN	29.6.50	G. Kinnell, O.B.E.	T. A. Bennett, G. Risley, G. Pool	S. Peeling	New Zealand Shipping Co., Ltd.
Rangitiki	GSXW	11.9.50	—. Burton	R. Webster, G. W. Dunsford, R. C. Kinloch, K. J. Field	J. Poyner	New Zealand Shipping Co,. Ltd.
Rangitoto	GLMV	8.5.50	A. E. Lettington, O.B.E., D.F.C.	G. Bevis, E. B. Mallett, J. Mason, A. Finch	E. R. Saunders	New Zealand Shipping Co., Ltd.
Regent Hawk	GMND	20.9.50	J. Ward	T. Moncrieff, A. R. Cardno, Z. Wojewodzki	R. W. Jones	Regent Petroleum Tankship Co., Ltd.
Reina Del Pacifico	GMPS	29.6.50	J. Whitehouse	J. A. Greenwood, J. Peters, W. J. Campbell	J. Butler	Pacific Steam Navigation Co.
Repton	GPFL	27.3.50	D. Cownie	D. M. Muir, W. Jones, O. N. Selwood	A. Lloyd	Galbraith, Pembroke & Co., Ltd.
Rhodesia Star	GUAX	24.2.50	G. L. Evans	G. A. Horner, T. W. Jones, R. B. Escreet	A. R. Roe	Blue Star Line, Ltd.
Rialto	GBLV	21.4.50	E. Tyler	J. Etches, H. Riley, K. H. Thompson	J. Sanderson	Ellerman's Wilson Line, Ltd.
Richmond Castle	GCSP	8.7.50	A. C. M. Black, O.B.E.	—. Freer, —. Oswald, G. D. Attwood	T. W. Shea	Union-Castle Mail S.S. Co., Ltd.
Richmond Hill	GMKJ	20.4.50	S. Sloan	—. Huggins, D. Goodwin, —. Heppingstone	—. Longton	Counties Ship Management Co., Ltd.
Rippingham Grange	GIGP	1.7.50	R. Owen, O.B.E.	H. Butler, A. J. Bulley, J. Taylor, A. H. Fawcett	R. G. J. Alton	Houlder Bros. & Co., Ltd.
Rochester Castle	GZQF	25.4.49	T. H. Whatley	G. D. Fowler, R.D., Lt.-Cdr. R.N.R., J. V. H. Drummond, D. Campbell	G. Mein	Union-Castle Mail S.S. Co., Ltd.
Roslin Castle	GYJZ	25.7.50	F. R. Pope	R. J. Miller, D. Lawton	J. Tuck	Union-Castle Mail S.S. Co., Ltd.
Rowallan Castle	GDFT	12.9.50	R. A. D. Cambridge, D.S.C., R.D., Cdr. R.N.R.	R. H. Hudson, E. J. C. Bennett	M. K. Knowles	Union-Castle Mail S.S. Co., Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Roxburgh Castle	GBGS	25.1.50	J. D. B. Fisher	P. Eckford, M. Kenshole	L. W. Bettinson	Union-Castle Mail S.S. Co., Ltd.
Rubystone	MARK		E. J. Griffiths			Navigation & Local Trade Co., Ltd.
Rutland	GTCP	8.1.47	W. Thom	J. A. Williamson, J. Turnbull	J. Macfarlane	Currie Line, Ltd.
Ruysdael	MAQP	14.3.50	J. Burns	F. Howgego, J. T. Hibbert, P. Yorke	W. Vaughan	Bolton S.S. Co., Ltd.
Sacramento	GKCN	20.2.50	J. E. Robinson, M.B.E.	W. White, W. Walker, J. A. Ryley	J. P. Carter	Ellerman's Wilson Line, Ltd.
St. Crispin	MBSW	10.12.47	A. E. Hall	D. L. Verity	D. L. Verity	B. A. Parkes
St. Zeno	MQMJ		L. Abbey			T. Hamling & Co., Ltd.
Salacia	GZRN	16.1.50	T. S. Graham	G. M. Clark, D. Nicholson, I. MacGregor	W. Docherty	Donaldson Bros. & Black, Ltd.
Salamanca	GLSG	13.4.50	D. W. Hutchison	R. B. Bryant, E. L. Sleeman, K. Williams	F. Fitzgerald	Pacific Steam Navigation Co.
Salaverry	GBLQ	11.1.50	G. B. Wardale	P. D. O'Driscoll, P. B. Webster, R. Riley, K. Williams, G. A. Duffey	J. Slater	Pacific Steam Navigation Co.
Salinas	GLLK	22.5.50	H. Heardley	A. Powell, J. Weatherstone, W. R. Holmes	J. Cummins	Pacific Steam Navigation Co.
Samanco	MARQ	20.4.49	A. Lyall	D. I. Jones, W. B. Holmes, T. Lewis	A. Hatfield	Pacific Steam Navigation Co.
San Adolfo	GYKK	16.11.49	L. Mays	T. Magee, D. P. Carroll, D. Frazer	B. A. Palin	Eagle Oil & Shipping Co. Ltd.
San Cirilo	GZMR	4.8.50	T. L. Pearson	E. N. Givens, W. D. Hepworth, D. N. Richards	W. W. Ellison	Eagle Oil & Shipping Co., Ltd.
San Felix	GFJZ	29.7.50	C. Summers	J. Whyborn, R. Wilkinson, E. V. Mace	W. L. Radcliffe	Eagle Oil & Shipping Co., Ltd.
San Velino	GCNY	18.8.50	J. B. Macarthy	M. H. Jones, G. G. B. Putt, J. F. Kemp, F. Bailey	J. P. K. Leary	Eagle Oil & Shipping Co., Ltd.
San Veronico	MASQ	22.5.50	W. Lamb	W. W. Gibb, J. Hunter, R. Atkinson	R. G. Morris	Eagle Oil & Shipping Co., Ltd.
San Vulfrano	MASR	3.10.50	F. R. H. Atkinson	T. D. Wright, D. P. Carroll, R. K. Wighley	E. Ingham	Eagle Oil & Shipping Co., Ltd.
Sansu	GQQN		O. Owens, O.B.E.			Elder Dempster Lines, Ltd.
Santander	GBNR	28.11.49	T. J. Naylor	K. Thomas, O. A. Baker, J. T. Bruce	C. Murray	Pacific Steam Navigation Co.
Sarmiento	MARW	5.3.49	G. H. Rice	T. Hiatt, F. Nuttall, W. A. E. Johnstone	N. Roberts	Pacific Steam Navigation Co.
Saxon Star	MARX	24.7.50	J. D. W. Davies	H. Tompsett, D. Gaffney, G. Irving	A. Reece	Blue Star Line, Ltd.
Scottish Prince	GDSK	3.10.50	J. L. Edwards	R. W. B. Brown, N. Gale, G. Ballard	P. M. Evans	Furness, Withy & Co., Ltd.
Scythia	GDYP		W. M. Stewart, O.B.E.	W. L. McDougall		Cunard Steamship Co., Ltd.
Selector	MARZ	3.3.49	W. H. Slaughter	W. McInnes, W. Owens, O. T. Jones, P. A. Leighton	J. Clerk	T. & J. Harrison
Settler	GTTX	28.2.50	R. F. Phillips	J. Bean, P. Dilleigh, S. Gamble	W. Macmahon	T. & J. Harrison
Shielbank	GDPZ		C. S. Holbrook			Andrew Weir & Co., Ltd.
Silverbriar	GDWM	15.5.50	W. N. Tulloch	J. H. Tomlinson, D. Lamont, A. N. Cockcroft	J. A. Wickers	Silver Line, Ltd.
Silverguava	GMVK	12.10.50	J. Duncan, O.B.E.	F. Hewitt, J. S. Bowman, G. A. Hubbard	J. P. Deagan	Silver Line, Ltd.
Silveroak	GCQR	29.8.50	E. Palmer	J. McK. Batchen, J. M. Donaldson, E. A. Hansen	H. Melling	Silver Line, Ltd.
Silverplane	MABL	19.8.49	R. H. Woodrow	P. C. Palmer, K. Allen, G. Stobo	—. Arthurs	Silver Line, Ltd.
Silversandal	GSFQ	2.6.50	J. Thompson	E. E. Reed, M. J. S. Beaumont, M. A. A. Oldakoski	P. Killeen	Silver Line, Ltd.
Silverteak	GSFR	30.12.49	E. L. Tilmouth	S. W. Rothwell, H. Rose, M. Bingham	J. Thomas	Silver Line, Ltd.
Silverwalnut	GSFT	21.4.50		W. J. Ross, J. B. de Wet, F. E. West	J. Hands	Silver Line, Ltd.
Sneaton	GDBS	29.3.50	W. Armstrong	E. Wilson, W. Locker, F. Newton, F. T. Lamb	C. Fletcher	Headlam & Son
Socotra	MASC	14.6.50	J. C. Last, O.B.E., Cdr. R.N.R.	D. A. Hansing, J. L. Dunkley, —. Blyth, —. Rimmer	H. J. Camp	P. & O. Steam Navigation Co.
Somerset	GJMN	8.7.50	D. C. Chadwick	N. I. Collett, W. F. Dan, M. J. Ruffhead	P. Broome	Federal Steam Navigation Co., Ltd.
South Africa Star	GUAU		R. White, D.S.C.			Blue Star Line, Ltd.
Southern Atlantic	GBLY	30.8.50	M. G. Oliver	L. M. Smith, A. Anderson, D. Lawson	P. Curson	Chr. Salvesen & Co.

Southern Collins ..	MASE	20.4.50	L. Robertson	D. Moar, G. Reid	J. MacKinnon ..	Chr. Salvesen & Co.
Southern Garden ..	MASF	1.5.50	W. J. Swanson	W. Scott, N. McLean, D. A. Watt ..	G. R. Campbell ..	Chr. Salvesen & Co.
Southern Harvester ..	GFZJ	20.4.50	K. Granoe	J. E. M. Balfour, F. Johansen	A. Turnbull	Chr. Salvesen & Co.
Southern Opal ..	MASG	22.8.50	A. F. Baikie	W. Spence, J. L. Logie, R. Kinder, J. Flucker	C. Houston	Chr. Salvesen & Co.
Southern Venturer ..	GNNM	1.5.50	H. Myhre	A. W. Aitken, R. P. Tweedie	J. Hawick	Chr. Salvesen & Co.
Sovac	GDDV	18.8.50	A. McCausland	J. L. James, H. E. Harrington, D. Gleadow	K. C. Morris ..	Vacuum Oil Co., Ltd.
Speaker	GCGT	28.7.50	E. V. Dunn	G. Hind, R. J. Abbott, J. B. Mitchell ..	G. A. Bart	T. & J. Harrison
Specialist	GCYF	10.11.48	L. F. Harriman	J. Beam, A. F. Perry	J. Glover	T. & J. Harrison
Springfjord	GQKQ	18.1.49	T. R. Mackle	J. Reid	A. Guy	Springwell Shipping Co., Ltd.
Stancourt	GKCP	10.12.49	S. G. G. Williams ..	J. R. Jones, C. G. Smeaton, J. C. Nichol	M. K. Kavanagh ..	J. A. Billmeir & Co., Ltd.
Stanhall	GCQZ	5.5.49	H. V. Wightman	P. J. Macpherson, L. A. Bowen-West ..	O. R. Wilcox ..	J. A. Billmeir & Co., Ltd.
Stirling Castle ..	GYPX	5.9.50	W. A. Pace, O.B.E. ..	K. T. McNish, R. Kirton, D. A. Garman	P. P. Williams ..	Union-Castle Mail S.S. Co., Ltd.
Stirlingshire	GCQD	13.9.50	E. W. Jenkins	T. R. Halliday, J. Caley, G. M. Silvers ..	N. J. Braddon ..	Turnbull, Martin & Co., Ltd.
Strathaird	GRSX	3.10.50	H. S. Allan, R.D., Cmde. R.N.R.	R. Bullock-Webster, G. E. Howe, J. S. Anderson	J. F. Clark	P. & O. Steam Navigation Co.
Stratheden	GDGT	8.9.50	S. W. S. Dickson	M. O'Connell, D. C. Guthrie	H. S. Horn	P. & O. Steam Navigation Co.
Strathmore	GYMS		E. Lee	J. B. Wilson, B. Thomson, C. I. H. Greaves		P. & O. Steam Navigation Co.
Strathnaver	GRPZ		J. C. Mellonie	J. Bolas		P. & O. Steam Navigation Co.
Struan	MASJ	2.6.50	M. Polson	S. Sutherland, —. Ross, G. MacDonald ..	W. Hayes	Chr. Salvesen & Co.
Suffolk	GQQS	3.10.50	F. Pover	B. E. Applegate, P. J. Field, M. J. Byrd ..	H. Hare	Federal Steam Navigation Co., Ltd
Suncrest	GNWW	13.10.50	A. Miller	N. Munce, P. A. Kelly, J. B. Dale ..	G. Dennison ..	Crest Shipping Co., Ltd.
Sutherland	GBYG	29.6.50	R. W. Nicolson	E. F. Smith, C. R. Madsen, R. Campbell	I. R. Lloyd	B. J. Sutherland & Co., Ltd.
Swainby	GPFS	22.5.50	J. E. Roddam	K. Jackson, A. C. Bolton, W. Fallon ..	D. Ford	Sir R. Ropner & Co., Ltd.
Sydney Star	MKSM	8.7.50	T. F. McDonald, O.B.E. ..	R. H. R. Jones, F. A. Ball, I. C. Mackintosh	J. McConnell ..	Blue Star Line, Ltd.
Talca	GCDT	22.5.50	H. Eardley	R. Riley, A. Gibson, M. Backhouse ..	S. Johns	Pacific Steam Navigation Co.
Tamaroa	GFWX	11.9.50	W. Thompson	J. Beck, D. Ede, E. Magill, H. Singleton	D. McCrae	Shaw, Savill & Albion Co., Ltd.
Tamele	GCBF	18.10.50	C. H. Sweeney	S. Owen, D. Thompson, G. Lightfoot ..	F. Broomfield ..	Elder Dempster Lines, Ltd.
Tarkwa	MASU	4.10.50	G. D. Simpson	C. H. Brooker, G. Cooke, R. Martin ..	G. I. Gilling	Elder Dempster Lines, Ltd.
Tasso	GLMR		F. Mason	D. J. C. Martin, J. E. Wray, R. Whittleton	J. Williamson ..	Ellerman's Wilson Line, Ltd.
Tekoa	GJFQ	15.5.50	H. D. Horwood, R.D., R.N.R.	W. E. Peto, C. E. Burrill, P. B. Eccles ..	W. F. Shepherd ..	New Zealand Shipping Co., Ltd.
Telemachus	GBLB	11.2.49	J. F. Webster	A. G. Reed, P. D. F. Cruickshank, E. Brown	J. Campbell Wilson ..	A. Holt & Co.
Teviot	MASX	29.6.50	L. T. Peterson	H. W. Riley, J. T. Jones, R. G. Stapleton	F. Fawcett	Royal Mail Lines, Ltd.
Thamesfield	GDGK	16.12.48	R. Cunningham	J. P. Ross, R. L. Newcombe, P. B. Goldie	T. Carter	Hunting & Son, Ltd.
Theliconus	GBMT	3.10.50	T. W. A. Webster ..	R. J. Dias, J. V. Cook, C. Wilson ..	R. Keogh	Anglo-Saxon Petroleum Co., Ltd.
Tinto	GBYT	20.5.49	S. H. Bennett, M.B.E. ..	S. H. Bennett, A. Ledger, E. J. Agar ..	G. Nicholls	Ellerman's Wilson Line, Ltd.
Tongariro	GLFZ	14.6.50	C. P. Robinson	M. M. Shaw, R. Loveridge, J. B. Camping	J. A. Hasson	New Zealand Shipping Co., Ltd.
Torr Head	GZPW	13.10.50	M. Kennedy	E. G. Davy, J. McCormick, E. McCudden	G. Penketh	G. Heyn & Sons, Ltd.
Tregenna	GBPM		C. Lloyd Collings, O.B.E. ..			Hain Steamship Co., Ltd.
Trelevan	GBPQ		S. K. Hawken			Hain Steamship Co., Ltd.
Trelyon	GBPP		F. J. Cornish	H. Gravell, D. A. Loud, A. V. Rowles ..	T. H. Murrin ..	Hain Steamship Co., Ltd.
Tresillian	GCKP	9.9.49	J. Bates	P. E. Maiden, F. D. Ingram, B. Wise ..	W. F. Kavanagh ..	Hain Steamship Co., Ltd.
Tribesman	GBNZ	10.11.48	F. W. Wallice	W. Lawton, J. S. Jones, J. Adams, M. A. Patterson	J. T. W. Nixon ..	T. & J. Harrison
Tribulus	GFJS		F. Leask	L. G. Dennis		Anglo-Saxon Petroleum Co., Ltd.
Tronda	MMLX	24.4.50	W. Scott	W. J. Wiseman		Chr. Salvesen & Co.
Tweed	GBRP	14.6.50	G. S. Grant, R.D., Cdr. R.N.R.	G. C. W. Meldrum, J. Chester, R. B. Hill	G. C. Hammett ..	Royal Mail Lines, Ltd.
Twickenham	GNDC	22.11.49	J. A. Tully	H. Black, J. Porteous, J. C. Taylor ..	J. T. Berrie	Watts, Watts & Co., Ltd.
Umtali	GYWB	19.1.50	F. E. J. O'Hea	T. Rigby, F. Evans, D. G. Jupp, D. McNeill	S. Hewitt	Bullard, King & Co., Ltd.
Umtata	GDQF	13.9.50	J. W. Miles	G. T. Gibson, E. Levine, L. J. Farrer ..	A. H. Coxhead ..	Bullard, King & Co., Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Umzinto	GIFQ	3.10.50	R. Harber	E. Bicknell, J. H. Beavan, D. Banks ..	J. S. Sprunt	Bullard, King & Co., Ltd.
Valacia	MATR	10.3.50	J. D. Bradley, R.D., Cdr. R.N.R.	J. B. Mort, A. R. M. Graham, L. R. W. Portet	J. Patterson	Cunard Steamship Co., Ltd.
Vancouver City ..	GIGT	8.5.50	M. D. Louttit	J. Armstrong, J. B. Cuckow, E. Thompson	R. Butche	Sir Wm. Reardon Smith & Sons, Ltd.
Vardulia	GCFW	14.10.48	A. Sargent	J. M. Hughes, A. Crook, P. Walton ..	F. Berry	Cunard Steamship Co., Ltd.
Vasconia	MQJY	10.1.50	G. S. Evans	J. H. W. Locke, —. Lomax, E. Hall ..	R. Burns	Cunard Steamship Co., Ltd.
Vestra	MNNB	23.1.50	D. S. Archibald	D. C. White, H. M. Third		J. T. Salvesen & Co.
Volo	GPCJ	22.4.48	F. Ellison	T. Briggs, T. A. Firth, T. Johnson ..	G. Williams	Ellerman & Wilson Line, Ltd.
Waimana	MATW	18.8.50	C. L. Carroll, D.S.C., R.D., R.N.R.	A. C. D. Masters, J. Scott, D. E. Aberdeen	A. Morris	Shaw, Savill & Albion Co., Ltd.
Waipawa	GWXQ	3.4.50	F. A. Smith	J. Carroll, B. Hammond, H. M. Hignett, P. Arrowsmith	J. Murphy	Shaw, Savill & Albion Co., Ltd.
Wairangi	MATX	20.9.50	H. B. Smith	C. W. Sendall, B. Hammond, —. Hamilton	W. Freeman ..	Shaw, Savill & Albion Co., Ltd.
Waiwera	GBJB	25.1.50	G. P. McGraith	F. Charnley, J. Gunning, J. B. Cousins ..	J. Downie	Shaw, Savill & Albion Co., Ltd.
Wanstead	GFLS		A. E. Woodcock			Watts, Watts & Co., Ltd.
Warwick Castle ..	GRRJ	3.10.50	J. Trayner	R. Taylor, P. E. Eckford, N. E. Upham ..	E. Shaw	Union-Castle Mail S.S. Co., Ltd.
Wendover	GFML		W. Donald	E. Peirce	D. I. J. Townsend ..	Watts, Watts & Co., Ltd.
William Scoresby ..	GFNM		A. F. Macfie, Lt.-Cdr. R.N.R.			National Institute of Oceanography
Winchester Castle ..	GTPZ	26.8.50	H. A. Deller	T. Morgan, —. Fancourt, —. Braithewaite	R. Brew	Union-Castle Mail S.S. Co., Ltd.
Woodford	GFMM		F. W. Grist			Watts, Watts & Co., Ltd.
Worcestershire ..	GFZM		F. C. Brooks	R. B. Williams		Bibby Bros. & Co.
Yoma	GLPN	14.11.49	S. Thompson	J. Whitehead, W. F. Harris, T. F. Fields ..	W. Allen	Henderson & Co.
Zealandic	MAGJ	29.6.50	P. F. Owens	P. T. Brentnall, I. Saunders, B. Ditchburn	A. McLennan ..	Rio Cape Line, Ltd.
Zent	GRDW	28.1.48	F. P. Inch			Elders & Fyffes, Ltd.

Supplementary Ships

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Bellerby	MQJF		F. Tate			Ropner Shipping Co., Ltd.
British Duke	GVSW		H. J. McMichael	W. McMorland, J. A. Duck, D. E. Buckley	F. D. Musson	British Tanker Co., Ltd.
Cedarpool	MAHG		J. E. Roddam		N. O'Laughlin	Sir R. Ropner & Co., Ltd.
Eastbank	GFKR		R. Smith	C. G. Watterson, P. Hewitt	W. D. Atkinson	Andrew Weir & Co., Ltd.
Empire Dove	GCMZ		J. Walker			MacAndrews & Co., Ltd.
Empire Ely	MAYM		J. Mitchell			Common Bros., Ltd.
Folda	MLFR		E. Tulloch			Chr. Salvesen & Co.
Frobisher	GTRN		V. A. Buschini	J. A. Wright		R. S. Hewett
Generton	GZJB		W. Wilson			R. Chapman & Son
Greenland	GCLJ		R. Borthwick	W. J. S. Flett	D. W. Crearit	Currie Line, Ltd.
Harmattan	GNYD		A. F. Lidguard			J. & C. Harrison, Ltd.
Maple Hill	MANE					Counties Ship Management Co.,
Markab	GCVT	20.5.49	R. Chapman	A. Stuart, W. Russell	W. Brown	Phocean Ship Agency, Ltd. [Ltd.
New Prince	GBRN		N. Jinks			R. S. Hewett
Red Charger	GCNF		H. Daniels			E. D. W. Lawford
Red Crusader	GTBP		R. Nash			E. D. W. Lawford
Red Knight	MBQT		J. Tomlinson	F. O'Brian	R. Green	E. D. W. Lawford
Red Lancer	MKTP		E. Littler			E. D. W. Lawford
Red Rose	MFMX		J. McKernan			E. D. W. Lawford
Robert Hewett	MDYS		G. Elliot	H. Wilcock		R. S. Hewett
Stagpool	MBBS		W. Stein			Sir R. Ropner & Co., Ltd.
**Queen of Bermuda*	GZKF		L. F. Banyard, O.B.E.	N. E. James	H. Stennett	Furness, Withy & Co., Ltd.
Conway, H.M.S.	—	1.9.50	E. Hewitt, R.D., Capt. R.N.R.	The Senior Cadets	—	—
Pangbourne Nautical College	—	3.4.48	H. C. Skinner, O.B.E., Cdr. R.N.	The Senior Cadets	—	—
Worcester, H.M.S.	—	31.7.50	G. C. Steele, V.C., Cdr. R.N. (Retd.)	The Senior Cadets	—	—

* This ship has been recruited by the Bermuda Meteorological Service.

FLEET LIST (Australia)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of Australia

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owners/Agents
Selected Ships:				
Canara	W. Bird, O.B.E.	T. Woodward, J. D. Campbell, C. C. Springall	P. A. Stuart	British India Steam Nav. Co.
Chupra	J. D. Woods	C. Allerton, H. S. Strawbridge, W. L. Hillcoat	R. C. Whiting	British India Steam Nav. Co.
Idomeneus	J. L. Johnston	W. A. Clark, G. D. F. Cruickshank, P. S. Lombard, G. Moncks	A. N. Williams	A. Holt & Co.
Koolinda	J. S. Airey	J. Paulsen, J. Palfreyman, R. Seaward	H. White	Western Australian State Steamships
Koomilya	F. W. Roberts	C. Stewart, R. Sicklin, G. Steinbeck	F. Mackie	McIlwraith, McEacharn, Ltd.
Kooringa	F. McLean	A. D. Hanson, V. Bovell, J. A. Grey		McIlwraith, McEacharn, Ltd.
Lowana	L. Fry	C. A. Blow, T. H. Millidge, J. K. Saint	R. M. Rees	Melbourne Steamship Co., Ltd.
Nellore	T. Mills	A. Johnston, G. Champion, G. Cleveland, K. Skinner	J. Bell	Eastern & Australian S.S. Co., Ltd.
Orestes	F. J. Cockburn	A. Surtees, G. Kitching, R. Denning, P. Beckett	J. Dennison	A. Holt & Co.
River Burnett	L. G. Ramsay	R. Campbell, H. W. Robinson, T. Beckinsale	F. E. Audsley	Australian Shipping Board
River Clarence	W. W. Fish	A. T. Lake, I. K. S. Adam, S. F. Dockwell	G. Harper	Australian Shipping Board
River Mitta	A. Knight	G. Davies, K. Clarence, W. Wiggins	M. Pearson	Australian Shipping Board
Triadic	A. Rhoades	J. P. Milton, W. L. Harboard, W. B. Jeavons	M. Hayter	British Phosphate Commission
Trienza	P. Richardson	D. Neilson, D. Robb, K. Oliver	J. Ward	British Phosphate Commission
Triona	C. L. Evans	P. W. Thompson, S. E. B. Harris, B. J. Robertson	R. G. Neale	British Phosphate Commission
Supplementary Ships:				
Diomed	A. M. Caird	H. A. Jeffrey, K. W. Dunlop, E. Webb	C. Palmer	A. Holt & Co.
Derrigo				Australian Shipping Board
Kybra				Western Australian State Steamship

FLEET LIST (Hong Kong)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Royal Observatory, Hong Kong

Name of Ship	Captain	Observing Officers	Senior Radio Officer	Shipping Company or Operators
Anhui	A. Naismith	H. Pilling, F. W. Ridley, G. Young	Leung Shu Fun	China Navigation Co., Ltd.
Anking	E. H. Histed	W. Davidson, J. G. de Veale, G. Baxter	G. W. Moore	China Navigation Co., Ltd.
Caroline Moller	W. J. Lang	L. Klaeboe, H. L. Whitlock, N. F. Andrade	P. N. Bhatt	Mollers (Hong Kong), Ltd.
Chang Sha	C. P. Muller	W. J. Bunney, S. Fergusson, R. Tasker, P. Baxter	R. Gooseman	China Navigation Co., Ltd.
Chit Sein	K. D. Lam			Burma Navigation Corporation, Ltd.
Choy Sang	R. G. Stanton	W. J. Bartlett, P. D. Coles, Yeung Koh Ching	Lai Choi Hoi	Indo-China Steam Navigation Co., Ltd.
Chun Sang	D. G. R. Kinnear	E. M. Norman, D.S.C., E. Jones, Yuan Tso Ying	E. A. West	Indo-China Steam Navigation Co., Ltd.
Eastern Glory	L. McRae	T. J. Ashcroft, E. A. Ladbrooke, R. Grieve, R. W. E. Little	C. D. Evans	Australia China Line, Ltd.
Eastern Saga	S. Schofield	M. I. Groundwater, M. J. K. Crichton, J. D. Markland	R. E. Stewart	Australia China Line, Ltd.
Eastern Trader	J. L. Baines	R. A. P. Foxley, Fong Chao Hong, Cheung Siu Tung	F. Delage	Hong Kong Eastern Shipping Co., Ltd.
E. Sang	G. Owens	L. C. Cox, N. B. Hall, A. D. Lamb	T. R. Crockett	Indo-China Steam Navigation Co., Ltd.
Fengtien	F. Gibbs	D. J. Mander, J. F. O'Connor, T. R. Young	Tsang Pui Leung	China Navigation Co., Ltd.
Foochow	F. Kelly	A. V. Harrison, J. R. Brett, A. P. Sokoloff	Leung Man Hin	China Navigation Co., Ltd.
Fort Charlotte	F. P. Hennin, O.B.E.	G. D. Pentney, T. J. Owen, P. P. Garbutt	G. H. Parker	Royal Fleet Auxiliary
Frosty Moller	P. R. Dixon	W. J. Young, D. Harper	Chan Sin Mang	Mollers' (Hong Kong), Ltd.
Fukien	E. G. Thomas	G. A. Abbs, R. Perry, A. Roddis	Leung Tjeuk Shing	China Navigation Co., Ltd.
Green Ranger	E. Payne	B. V. Dobbie, B. Kinmond, J. Purdy	A. M. A. Champney	Royal Fleet Auxiliary
Greystoke Castle	L. Rowe	F. Kelly, J. C. E. Crowden, R. N. Frappell	D. G. Sims	Mollers' (Hong Kong), Ltd.
Hai Lee	J. Hansen			China Siam Line
Hai Meng				China Siam Line
Hang Sang	L. W. Harrison	K. P. Wilkinson, A. Moyse, A. Nelson	Young Shang	Indo-China Steam Navigation Co., Ltd.
Han Yang	G. P. Cope	L. Walker, A. C. Ingles, Lu Ping Hai	Lo Kin Chek	China Navigation Co., Ltd.
Heinrich Jessen	G. R. Hansen			Jebsen Steamship Co., Ltd.
Hermelin	B. Eliassen			China Siam Line
Hew Sang	D. G. Burleigh	B. D. Hoatson, I. Rowland-Jones, H. Wood	Ho Hung Ki	Indo-China Steam Navigation Co., Ltd.
Hin Sang	W. T. Rochester	E. P. Ladbrooke, L. Manser, D. D. Battell	Tang Kwong Ho	Indo-China Steam Navigation Co., Ltd.
Hiram	O. Olsen			China Siam Line
Hoi Houw	O. M. Klette	K. Munkejord, O. Oftedal, H. Kiristoffersen	A. J. Takvam	Jeboshun Shipping Co.
Hoi Wong	M. Bjerkenes	M. Fishaaen, B. Macland, O. Lindanger	H. Bru	Jeboshun Shipping Co.
Hunan	A. H. Finnie	D. P. Manthorpe, P. Flory, J. R. Durup	Choi Pong Cheung	China Navigation Co., Ltd.
Hupeh	J. W. E. Warrior	W. Pollock, J. R. Suffren, R. J. Porter	Tsang Kan	China Navigation Co., Ltd.
Kut Sang	C. R. Harris	J. M. McFarlane, B. D. Johnson, J. G. Perrin	G. McDonald	Indo-China Steam Navigation Co., Ltd.

Lwei Yang	W. B. B. Paul	H. M. Stanfield, V. Walker, J. C. Anderson	Liu Yuk Kong — China Navigation Co., Ltd.
Rok Sang	R. I. Groundwater	F. W. Cross, J. McK. Marshall, Keng Jen Ko	J. E. Chew — Indo-China Steam Navigation Co., Ltd.
Mau Sang	R. G. Gillespie	D. R. McFadzien, C. Przybylinski, A. O. Jakobsen	Ma Ping Leung — Indo-China Steam Navigation Co., Ltd.
Mui Ann	A. Bj. Justad	H. Pettersen, T. Johnsen, H. Asheim	A. Ovland — Chin Seng Hong Shipping Co.
Mui Heng			Chin Seng Hong Shipping Co.
Muncaster Castle	A. G. Gorham	W. A. Findlay, L. L. Watson, P. Pott, D. J. Evans	V. B. Ritson — Mollers' (Hong Kong), Ltd.
Pakhoi	D. Needham	K. McLeod, E. W. Woodcock, P. Bulatoff	Tang Chung Fui — China Navigation Co., Ltd.
Poyang	D. McG. Holmes	P. T. Yeandle, M. D. B. Sweeny, Li Che Lim	Li San Kau — China Navigation Co., Ltd.
Sangola	J. B. Cooke	L. O. Harborow, J. R. Snelgrove, D. Raine, W. G. White	R. O. Smith — British India Steam Navigation Co., Ltd.
Shansi	J. W. Evans	W. J. Coburn, S. E. B. Harris, R. D. A. Owen	Pun Kwong Yee — China Navigation Co., Ltd.
Shengking	J. G. Smart	R. E. Selwyn-Jones, D. I. Robertson, V. A. Boutskoi	Chau Wing — China Navigation Co., Ltd.
Sinkiang	A. Taylor	A. Watson, J. Hunter, P. H. Ward	Chin Fook On — China Navigation Co., Ltd.
Sirdhana	W. Brawn, M.B.E.	D. S. Hutton, H. W. Bolles, P. R. Daniels	J. E. Ward — British India Steam Navigation Co., Ltd.
Soochow	E. Bruce	V. R. Woolfe, J. C. Christal, Laigen Kwong	F. Gelatly — China Navigation Co., Ltd.
Szechuen	O. Fox	G. D. O. Rennie, D. S. Southey, T. M. J. Davies	Leung Cheuk Shing — China Navigation Co., Ltd.
Tai Chung Shan	A. H. Bathurst	A. E. Lovgreen, Chan Sai Chung	Pong Shiu Lun — Shun Cheong Steam Navigation Co.
Tai Yuan	Y. N. Campbell	B. McLennan, A. O. Atkinson, H. A. Ledeboar	D. F. MacDonald — China Navigation Co., Ltd.
Tak Sang	E. J. Thomson	J. R. G. Findlay, W. Graham, J. R. Burston	Im Ki — Indo-China Steam Navigation Co., Ltd.
Tsinan	J. McKinlay	C. A. N. Baker, G. A. Rankin, W. T. Masters	Wai Pun Un — China Navigation Co., Ltd.
Wing Sang	H. G. Goddard	H. A. Greenwood, C. M. Wilson, A. A. Watson	A. G. Lum — Indo-China Steam Navigation Co., Ltd.
Wo Sang	N. H. King	L. I. Ovslanikoff, R. P. Farquar, K. Y. Feng	A. W. J. Levack — Indo-China Steam Navigation Co., Ltd.
Yochow	F. Hindle	S. Davidson, A. Harper, Wu Kwei Wen	Cheung Shing Cheung — China Navigation Co., Ltd.
Yunnan	W. E. Hargrave	J. R. Keddie, C. Stark, D. J. Coombes	U In San — China Navigation Co., Ltd.

FLEET LIST (New Zealand)
VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships, voluntarily co-operating with the Meteorological Service of New Zealand.

Name of Vessel	Captain	Observing Officer	Radio Officer	Owners
Selected Ships :				
Kaitoke	A. F. Inman	G. R. Inkster	L. M. Harvey	Union S.S. Co., Ltd.
Karitane	C. W. Dovey	W. Weatherup	A. E. Whalley	Union S.S. Co., Ltd.
Kauri	J. Billingham	R. E. P. Williams	G. B. Blake	Union S.S. Co., Ltd.
Komata	W. J. Hill	P. Nash	R. H. Willis	Union S.S. Co., Ltd.
Kopua	F. T. Chapman	I. G. Sykes	W. L. Lambie	Union S.S. Co., Ltd.
Korowai	R. Blampied, M.B.E.	L. J. Lynch	T. Roberts	Union S.S. Co., Ltd.
Koromiko	H. S. Collier	H. G. Harwood	W. Hawkins	Union S.S. Co., Ltd.
Kurow	F. W. Gibson	A. W. Hannam	B. G. Hart	Union S.S. Co., Ltd.
Matua	A. R. Russell	R. D. Bennett	H. A. Shields	Union S.S. Co., Ltd.
Maui Pomare	L. C. Boulton	J. Hare	W. A. Taylor	Government of New Zealand
Monowai	G. B. Morgan, D.S.O.	K. D. Mitchell	J. G. Rea	Union S.S. Co., Ltd.
Piri	M. W. Monaghan	J. Drummond		I.C.I., Ltd.
Port Waikato	C. Keith	J. Flette		Holm & Co.
Waipori	S. C. Angus	R. K. Brown	J. Anderson	Union S.S. Co., Ltd.
Wairata	W. E. Jones	P. W. Callender	A. A. Lindsay	Union S.S. Co., Ltd.
Wairimu	C. Burgess	J. G. Waites	C. Ward	Union S.S. Co., Ltd.
Waitaki	E. F. Rainbow	R. G. Anderson	B. Sword	Union S.S. Co., Ltd.
Waitemata	D. M. Keith	J. A. Barbour		Union S.S. Co., Ltd.
Supplementary Ships :				
James Cook	A. Deed	E. G. Rapley	A. J. Jeans	H. C. S. Coasters
Kaimiro	D. C. Champion	H. A. Hodkinson		Union S.S. Co., Ltd.
Kakapo	R. Ainsworth	E. G. Trousdale	E. A. Miller	Union S.S. Co., Ltd.
Kamo	A. W. Pert	S. Peterson		Union S.S. Co., Ltd.
Karepo	W. Kehoe	E. M. Bieneman		Union S.S. Co., Ltd.
Kartigi				Union S.S. Co., Ltd.
Kiwitea	G. M. Schofield	A. B. MacDonald	R. N. Dennis	Union S.S. Co., Ltd.
Manuka	E. J. Johnston			Chatham Fishing Co.
Omana	H. L. P. Brown	H. J. Southworth	H. T. Fernandes	Union S.S. Co., Ltd.
Viti	F. A. Barrett	L. Lindsay		Tasman S.S. Co., Ltd.

FLEET LIST (South Africa)

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of South Africa.

Name of Ship	Captain	Observing Officer	Senior Radio Officer	Shipping Company or Operator
Africana II	R. L. V. Shannon, O.B.E.	A. Thomas, D.S.C.		Department of Fisheries, Cape Town
Agulhas	T. Y. Thompson	A. Harvey	E. Grover	South African Railways Ships, Cape Town
Aloe	R. Lewis	K. M. Botha	R. Parker	South African Railways Ships, Cape Town
Baltic Coast	H. H. Coor	L. W. Coltham	R. E. Star	Thesen's Steamship Co., Cape Town
Bokkeveld	A. W. Jewiss	I. A. Clark	F. P. Garnett	Arden Hall Steamship Co., Pretoria
Constantia	A. M. Barlow	P. A. T. Gordon	I. D. Flood	South African Marine Corporation, Cape Town
Damaraland	N. Waiter	M. A. Hoffman	J. Stamp	South African Lines, Ltd., Cape Town
Empire Victory				Union Whaling Co., Ltd.
Gilia	J. Lundberg			Irvin & Johnston, Ltd., Cape Town
Kaapland	C. B. Adkins	P. D. Aldworth	M. Hutchons	South African Lines, Cape Town
Morgenster	F. D. Wilkinson	H. M. Stephens	G. Adey	South African Marine Corporation, Cape Town
Namaqualand	B. Parnaby	C. B. O'Connor	P. Goggin	South African Lines, Cape Town
Pequenea		M. T. Scott		Tristan Exploration Co., Cape Town
Vergelegen	D. W. Thorpe	N. T. Casley	P. Boyd	South African Marine Corporation, Cape Town
South African Nautical College:				
General Botha	G. V. Legassick, D.S.C., R.D., Cdr., R.N.R.	The Senior Cadets		

FLEET LIST (India)

The following is a list of observing ships, voluntarily co-operating with the India Meteorological Department.

Name of Vessel	Owners
Selected Ships :	
Alavi	Mogul Line, Ltd.
Bahadur	Asiatic Steam Nav. Co. Ltd.
Chanda	British India Steam Nav. Co. Ltd.
Dara	British India Steam Nav. Co. Ltd.
Dumra	British India Steam Nav. Co., Ltd.
Dwarka	British India Steam Nav. Co., Ltd.
Englestan	Scindia Steam Nav. Co., Ltd.
Havildar	Asiatic Steam Nav. Co. Ltd.
Islami	Mogul Line, Ltd.
Jaladuta	Scindia Steam Nav. Co., Ltd.
Jalaganga	Scindia Steam Nav. Co., Ltd.
Jalamani	Scindia Steam Nav. Co., Ltd.
Jalamanjari	Scindia Steam Nav. Co., Ltd.
Jalarashmi	Scindia Steam Nav. Co., Ltd.
Jalaveera	Scindia Steam Nav. Co., Ltd.
Jalavihar	Scindia Steam Nav. Co., Ltd.
Jalayamuna	Scindia Steam Nav. Co., Ltd.
Jal-azad	Scindia Steam Nav. Co., Ltd.
Jehangir	Mogul Line, Ltd.
Kampala	British India Steam Nav. Co., Ltd.
Karanjia	British India Steam Nav. Co., Ltd.
Khandalla	British India Steam Nav. Co., Ltd.
Khosrou	Mogul Line, Ltd.
Mahadevi	Asiatic Steam Nav. Co., Ltd.
Maharaja	Asiatic Steam Nav. Co., Ltd.
Nadir	Asiatic Steam Nav. Co., Ltd.
Nurjehan	Asiatic Steam Nav. Co., Ltd.
Rajput	Asiatic Steam Nav. Co., Ltd.
Rajula	British India Steam Nav. Co., Ltd.
Shahjehan	Asiatic Steam Nav. Co., Ltd.
Singu	Burmah Oil Co. (Tankers), Ltd.
Sirsa	British India Steam Nav. Co., Ltd.
Subedar	Asiatic Steam Nav. Co., Ltd.
Tairea	British India Steam Nav. Co., Ltd.
Vasna	British India Steam Nav. Co., Ltd.
Yenangyaung	Burmah Oil Co. (Tankers), Ltd.
Supplementary Ships :	
Akbar	Mogul Line, Ltd.
Badarpur	Burmah Oil Co. (Tankers), Ltd.
Barala	British India Steam Nav. Co., Ltd.
Begum	Asiatic Steam Nav. Co., Ltd.
Bharatjal	Bharat Line, Ltd.
Itaura	British India Steam Nav. Co., Ltd.
Jaladurga	Scindia Steam Nav. Co., Ltd.
Jalagopal	Scindia Steam Nav. Co., Ltd.
Jalajawahar	Scindia Steam Nav. Co., Ltd.
Jalaketu	Scindia Steam Nav. Co., Ltd.
Jalakrishna	Scindia Steam Nav. Co., Ltd.
Jalamayur	Scindia Steam Nav. Co., Ltd.
Jalaratna	Scindia Steam Nav. Co., Ltd.
Jalavijaya	Scindia Steam Nav. Co., Ltd.
Malika	Asiatic Steam Nav. Co., Ltd.
Masimpur	Burmah Oil Co. (Tankers), Ltd.
Nurani	Asiatic Steam Nav. Co., Ltd.
Pasha	Asiatic Steam Nav. Co., Ltd.
Risaldar	Asiatic Steam Nav. Co., Ltd.
Rizwani	Mogul Line, Ltd.

FLEET LIST (Canada)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of Canada.

Name of Vessel	Owners
Selected Ships	
Aorangi	Canadian Australasian Line.
Canadian Challenger	" Canadian Challenger ", Ltd. (Canadian National Steamships).
Canadian Constructor	" Canadian Constructor ", Ltd. (Canadian National Steamships).
Canadian Cruiser	" Canadian Cruiser ", Ltd. (Canadian National Steamships).
Fort Amherst	Furness, Withy & Co.
Fort Townshend	Furness, Withy & Co.
Imperial Alberta	Imperial Oil, Ltd.
Imperial Quebec	Imperial Oil, Ltd.
Imperial Toronto	Imperial Oil, Ltd.
Imperial Winnipeg	Imperial Oil, Ltd.
John S. Pillsbury	Upper Lakes and St. Lawrence Transportation Co. Ltd.
Lady Nelson	" Lady Nelson ", Ltd. (Canadian National Steamships).
Lady Rodney	" Lady Rodney ", Ltd. (Canadian National Steamships).
Lake Minnewanka	Western Canada Steamship Co., Ltd.
Lake Pennask	Western Canada Steamship Co., Ltd.
Lake Sicamous	Western Canada Steamship Co., Ltd.
Lake Winnipeg	Western Canada Steamship Co., Ltd.
Ottawa Valley	Montreal, Australia, New Zealand Line, Ltd.
Waihemo	Canadian Union Line, Ltd.
Waikawa	Canadian Union Line, Ltd.
Wairuna	Canadian Union Line, Ltd.
Waitomo	Canadian Union Line, Ltd.
Yamhill	Imperial Oil, Ltd.
Lightships :	
Lurcher Lightship	Minister of Transport.
Sambro Lightship	Minister of Transport.
Supplementary Ships:	
Lake Manitou	Western Canada Steamship Co., Ltd.
Pinnacles	Deep-Sea Tankers, Ltd.
Rupertsland	Hudson's Bay Co., Ltd.
Tantara	Johnson Walton Steamships, Ltd.

LIGHT VESSELS

The following Light Vessels voluntarily observe and report from coastal waters of Great Britain.

Name of Vessel	Masters
Dowsing	J. R. Audley, S. R. Smith
East Goodwin	A. Giblin, F. M. England
Galloper	S. J. Vincent
Humber	F. I. Butcher, L. A. Brett, P. G. Blyth
Newarp	B. Hadden, R. J. Middleton, E. A. Sparks.
Royal Sovereign	W. J. Sheaf
Shipwash	G. W. Broom, C. G. Isaac
Smith's Knoll	W. J. Hall, J. W. R. Reeve

MARID SHIPS

The following is a list of ships voluntarily observing and reporting sea temperatures from coastal waters of Great Britain. Captains are requested to point out any errors or omissions in the list.

Name of Vessel	Call Sign	Captain	Owners/Managers
Actuality	GPPF	W. Conn	F. T. Everard & Sons, Ltd.
Allurity	MQFS	W. N. Fisher	F. T. Everard & Sons, Ltd.
Amsterdam	MFBP	C. R. Baxter, D.S.C.	British Railways (Eastern Region)
Angelo	GQFY	S. N. Stokes	Ellerman's Wilson Line, Ltd.
Ariosto	GKPW	A. Morril	Ellerman's Wilson Line, Ltd.
Atlantic Coast	GWSY	C. A. Hopkins	Coast Lines, Ltd.
Baltraffic	GTXN	F. S. J. Butcher	United Baltic Corporation, Ltd.
Belhaven	MNXZ	P. L. Irvine	London & Edinburgh Shipping Co., Ltd.
Belravock	MKGV	T. Wallace	London & Edinburgh Shipping Co., Ltd.
British Scout	GJKD	R. S. Hughes	British Tanker Co., Ltd.
Cambria	GBKT	J. Hughes	British Railways (London Midland Region)
Clupea	GOAJ	J. Jappy	Scottish Home Department (Fishery Division).
Corfen	GDJX	E. R. W. Allen	Wm. Cory & Son, Ltd.
Corfleet	GWTD	A. G. Waller	Wm. Cory & Son, Ltd.
Corfoss	MAHX	F. E. W. Farrant	Wm. Cory & Son, Ltd.
Cormain	MAHT	R. B. Armstrong	Wm. Cory & Son, Ltd.
Cormead	GDBX	T. Slack	Wm. Cory & Son, Ltd.
Cormist	GDVT	R. J. Barrow	Wm. Cory & Son, Ltd.
Cormoat	GLKV	J. U. Hansen	Wm. Cory & Son, Ltd.
Cormull	MAHS	E. S. Keene	Wm. Cory & Son, Ltd.
Corncrake	MJKL	R. Beattie	General Steam Nav. Co. Ltd.
Crane	MMCS	C. Reynolds	General Steam Nav. Co. Ltd.
Drake	MMYC	R. B. Langley	General Steam Nav. Co. Ltd.
Duke of Argyll	GNVX	F. Adern, D.S.C.	British Railways (London Midland Region)
Duke of Lancaster	GCPQ	E. B. Serjeant	British Railways (London Midland Region)
Duke of Rothesay	GNVL	H. Thompson	British Railways (London Midland Region)
Eildon	MLZL	J. Little	G. Gibson & Co., Ltd.
Empire Cedric	GRSC	W. N. Johnson	Frank Bustard & Sons, Ltd.
Empire Gaelic	MAVR	H. T. Green	Frank Bustard & Sons Ltd.
Explorer	MRCZ	J. Finlayson	Scottish Home Department (Fishery Division),.
Falcon	MNXL	R. Warren	General Steam Nav. Co., Ltd.
Golden Dawn	— —	Lieut. A. Adamson, M.B.E., R.N.R.	The Captain
Grebe	MAEY	E. C. Painter, D.S.C.	General Steam Nav. Co., Ltd.
Guernsey Coast	MANS	F. C. Lucas, M.B.E.	British Channel Islands Shipping Co., Ltd.
Harrogate	MNDB	D. Stokes	Associated Humber Lines.
Hibernia	MBMT	R. Woodhall	British Railways (London Midland Region)
Highwood	MLQQ	J. Coupland	E. R. Newbigin, Ltd.
Hindlea	GWDQ	P. Cullen	Hindlea Shipping Co., Ltd.
Isle of Guernsey	GQYJ	F. E. Trout	British Railways (Southern Region)
Isle of Jersey	GRBQ	A. Light	British Railways (Southern Region
Isle of Sark	GTSR	C. E. Durley	British Railways (Southern Region)
London Merchant	MBRZ	C. A. Piper	London Scottish Lines, Ltd.
Malmo	GQCN	A. D. Seath	Ellerman's Wilson Line, Ltd.
Melrose	MCFD	G. Simpson	G. Gibson & Co., Ltd.
Melrose Abbey	GSYW	J. Laverack	Associated Humber Lines
Minna	GKPS	T. Mather	Scottish Fisheries.
Moray Coast	MKDL	J. T. Williams	Coast Lines, Ltd.
Ocean Coast	GYMP	G. Mearns	Coast Lines, Ltd.
Petrel	MBGV	W. J. Kelly	General Steam Nav. Co., Ltd.
Plover	MLLV	A. L. Ward	General Steam Nav. Co., Ltd.
St. Clair	MMFX	T. Gifford	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
St. Clement	GRGM	W. J. Ramsay	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
St. Helier	GLBT	R. Pitman, D.S.C.	British Railways (Western Region).
St. Julien	GLBV	L. J. Richardson	British Railways (Western Region).
St. Magnus	GFYK	W. G. Stout	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
St. Ninian	GJBB	A. M. Dundas	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
Salerno	GSPW	D. B. Ramsbottom, D.S.C.	Ellerman's Wilson Line, Ltd.
Scotia	GPYM	E. A. Bruce	Scottish Home Dept. (Fishery Division).
Selby	MLFT	G. Briggs	Associated Humber Lines.
Slieve Bawn	MQCC	W. N. Greenwood	British Railways (London Midland Region)
Slieve Bearnagh	MLNL	A. E. Willmott, D.S.C., R.D., Cdr. R.N.R.	British Railways (London Midland Region).
Slieve Bloom	MQDD	W. E. Meade	British Railways (London Midland Region).
Slieve Donard	MQCQ	A. C. Borthwick	British Railways (London Midland Region).
Slieve League	MQCM	R. A. H. Lord, D.S.C., R.D., Lt.-Cdr. R.N.R.	British Railways (London Midland Region).
Slieve More	MQBM	F. G. J. Manning, D.S.C.	British Railways (London Midland Region).
Southern Coast	MASD	J. Studholm	Coast Lines, Ltd.
Truro	GJTQ	J. B. Dunkley	Ellerman's Wilson Line, Ltd.
Vanellus	GDVW	J. E. Green	British & Continental S.S. Co., Ltd.
Vienna	GTBR	A. Pearson Sutton	British Railways (Eastern Region).
Wandle	MKBB	J. B. Dry	South Eastern Gas Board.

NOTICES TO MARINE OBSERVERS

Postal Arrangements

The quarterly numbers of *The Marine Observer* are published on the last Wednesdays of December, March, June and September.

The Marine Observer is addressed to the Captain, S.S./M.V....., c/o the owners, and captains are requested to make their own arrangements for forwarding.

Shipowners, Marine Superintendents, and all concerned in the despatch of mails to ships are asked to kindly facilitate the despatch and delivery of mail received at their offices from the Meteorological Office and " Air Publications and Forms Stores ", to their ships abroad.

Addressed to the captains of ships, this contains information required for the conduct of meteorological work at sea, and is most effective if received by the captains at the earliest possible date.

" The Marine Observer "

Captains of observing ships are requested to ensure that all officers, who participate in the voluntary meteorological work carried out by the ship, have access to *The Marine Observer*.

Ice Observation

Drifting ice, derelicts, and other floating dangers to navigation are reported by all means of communication at the disposal of the master.

See Chapter 12, pages 96–98 of the *Marine Observer's Handbook*, Seventh Edition.

It is also desirable that more detailed information than can be given in a TTT wireless message should be available to the Meteorological Office for the purpose of research, and for Admiralty Charts and Sailing Directions.

Marine observers will greatly assist by noting the conditions of ice, either drifting or fast, in the pages provided at the end of the logbook (Form 911), or on Form 912, which may be supplied to the captain of any British ship on application to a Port Meteorological Officer or Merchant Navy Agent.

Observing ships using the Trans-North Atlantic tracks are requested to record not only when ice is encountered, but also when they have passed through the ice region during the ice season without encountering ice. In this case a " nil " report should be returned, since it is desirable as far as possible to determine when tracks have been clear of ice.

RETURN OF LOGBOOKS

Owing to the need for strict economy in the use of paper, observing officers should endeavour to fill up their logbooks (Forms 911), before returning them to the appropriate Meteorological Service, except when insufficient space remains for the recording of observations during a further complete passage.

Meteorological Services for Shipping

Captains of British ships are requested to notify the Marine Branch of the Meteorological Office of areas in which meteorological services for shipping appear inadequate. Suggestions for the improvement of these services are always welcome.

GREAT BRITAIN—LOCAL WEATHER FORECASTS

Masters of ships and others interested in the movements of shipping and in the loading and discharging of cargo can obtain local weather forecasts from the forecast centre nearest to the port, free of charge.

The addresses and telephone numbers of the forecast centres nearest to the main ports of Great Britain are given below, corrected to May, 1950.

Enquirers by Telephone should ask for "The Forecaster."

PORT	ADDRESS OF NEAREST FORECAST CENTRE	TELEPHONE NO.
Aberdeen	The Meteorological Officer, Dyce Airport, Aberdeenshire	Dyce 331. Ex. 70
Bristol	The Meteorological Officer, Bristol Airport, Whitchurch, Bristol	Bristol 26451. Ex. 22
Cardiff	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 24465/6/7. Ex. 110, 111.
Dundee	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
Falmouth	The Senior Meteorological Officer, H.Q. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Glasgow	The Meteorological Officer, Renfrew Airport, Renfrewshire	Renfrew 2352. Ex. 21/3.
Hartlepool	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731/5. Ex. 230/1.
Hull	The Senior Meteorological Officer, H.Q. No. 1 Group, Royal Air Force, Bawtry, Doncaster, Yorkshire	Bawtry 363/7. Ex. 105
Kirkwall	The Meteorological Officer, Hatston Airport, Orkneys	Kirkwall 421. Ex. 2.
Leith	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
London	The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2	Holborn 3434. Ex. 629.
Liverpool	The Senior Meteorological Officer, Speke Airport, Liverpool, 19	Garston 1240. Ex. 21/2.
Milford Haven	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Newcastle	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731. Ex. 230/1.
Plymouth	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Southampton	The Senior Meteorological Officer, Southampton Airport	Eastleigh 87228. Ex. 8/10.
Swansea	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 24465/6/7. Ex. 110.

NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, GREAT BRITAIN

Captains and observing officers of the Voluntary Corps of Marine Observers will always be welcomed at headquarters, where the Marine Superintendent will be pleased to show them how their observations are utilised in meteorological research and weather forecasting.

Headquarters—Commander C. E. N. Frankcom, O.B.E., R.D., R.N.R., Marine Superintendent, Meteorological Office, Air Ministry, Headstone Drive, Harrow, Middlesex. (Telephone : Harrow 4331, Ext. 324.)

Commander J. Hennessy, R.D., R.N.R., Deputy Marine Superintendent. (Telephone : Harrow 4331, Ext. 323.)

Mersey.—Commander M. Cresswell, R.N.R., Port Meteorological Officer, Room 617, Royal Liver Building, Liverpool, 3. (Telephone : Central 6565.)

Thames.—Commander C. H. Williams, R.D., R.N.R., Port Meteorological Officer, Room 4, Ibex House, Minories, London, E.C.3. (Telephone : Royal 1721.)

Bristol Channel.—Mr. J. C. Matheson, Port Meteorological Officer, 2 Bute Crescent, Cardiff. (Telephone : Cardiff 4474.)

Southampton.—Captain J. R. Radley, Port Meteorological Officer, 19 Queen's Terrace, Southampton. (Telephone : Southampton 4295.)

Clyde.—Captain R. Reid, Port Meteorological Officer, 53 Bothwell Street, Glasgow. (Telephone : Glasgow Central 2558.)

AGENTS

Forth.—Captain G. More, " Craigneuk ", Dechmont, West Lothian. (Telephone : Dechmont 19.)

Humber.—Captain R. E. Dunn, c/o Principal Officer, Ministry of Transport, Trinity House Yard, Hull. (Telephone : Hull 38613.)

Tyne.—Captain F. B. West, Custom House Chambers, Quayside, Newcastle-on-Tyne. (Telephone : Newcastle 23203.)

OFFICERS OF THE METEOROLOGICAL SERVICES OF THE BRITISH COMMONWEALTH

AUSTRALIA

Melbourne.—Lieut.-Commander S. W. S. Robertson, D.S.C., R.A.N., Port Meteorological Officer, Meteorological Branch, Department of Interior, P.O. Box 1289K, Melbourne, Victoria. (Telephone : F.J. 9171.)

BRITISH EAST AFRICA

Dar-es-Salaam.—Meteorologist-in-Charge, Meteorological Department, Post Office Box 597. (Telephone : 2297.)

BRITISH WEST AFRICA

Accra.—The Chief Meteorologist, Meteorological Office. (Telephone : Accra 672.)

Bathurst.—The Meteorologist, Meteorological Office, Yundum. (Telephone : Yundum Airport, Ext. 9 and 21.)

Freetown.—The Meteorologist, Meteorological Office, Lungi. (Telephone: Lungi, Ext. 8.)

Lagos.—The Chief Meteorologist, Meteorological Office, Ikeja. (Telephone: Lagos 1081, Ext. 1.)

CANADA

Headquarters.—Controller, Meteorological Division, Department of Transport, 315 Bloor Street W., Toronto, 5.

Halifax.—O.I.C. Dominion Public Weather Office, 728 Dominion Public Building, Halifax, N.S. (Telephone: 3-8314.)

Saint John—Officer-in-Charge, The Observatory, Saint John, N.B. (Telephone: 3-3500.)

Vancouver.—Mr. R. F. Kennett, 815 Bower Building, 543 Granville Street, Vancouver, B.C. (Telephone: PAcific 3032.)

FIJI

Suva—Observer-in-Charge, Meteorological Office, Lauthala Bay.

HONG KONG

W. B. Goodfellow, Marine Liaison Officer, Royal Observatory. (Telephone: 58038.)

INDIA

Bombay.—The Director, Regional Meteorological Centre, Colaba, Bombay, 5. (Telephone: 35378.)

Calcutta.—The Director, Regional Meteorological Centre, Alipore, Calcutta, 27. (Telephone: South 2782.)

Madras.—The Director, Regional Meteorological Centre, Nakshatra Bungla, College Road, Madras, 6. (Telephone: 8109.)

MALAYA

Singapore.—The Director, Malayan Meteorological Service, Sixth Floor, Fullerton Building. (Telephone: 7123.)

NEW ZEALAND

Headquarters.—The Director, Meteorological Office, Kelburn, Wellington, New Zealand. (Telephone: 44418.)

Wellington.—Marine Meteorological Officer, Post Office Box 72. (Telephone: 44-418, Ext. 930.)

Auckland.—Port Meteorological Officer, Meteorological Office, Mechanics Bay, Auckland. (Telephone: 49551.)

Lyttleton.—Officer-in-Charge, Meteorological Office, Wigram Aerodrome. (Telephone: 32-585.)

Dunedin.—Officer-in-Charge, Meteorological Office, Taieri Aerodrome, Dunedin. (Telephone: 21-666.)

SOUTH AFRICA

Cape Town.—A. B. Crawford, Meteorological Office, Post Office, Maitland, Cape Town.

Some Atlases prepared in the Marine Branch of the Meteorological Office and published by His Majesty's Stationery Office

Atlantic Ocean

Monthly Meteorological Charts of the Atlantic Ocean (M.O. 483, 1948). 19¾ in. × 24 in. £2 15s. (1s.).

Monthly Sea Surface Temperatures of the North Atlantic Ocean (M.O. 527, 1949). 19¾ in. × 12¼ in. 10s. (3d.).

Quarterly Surface Current Charts of the Atlantic Ocean (M.O. 466, 1945). 22½ in. × 17¾ in. 12s. (6d.).

Monthly Ice Charts of Western North Atlantic (M.O. 478, 1944). 12 in. × 7½ in. 4s. (3d.).

Indian Ocean

Monthly Meteorological Charts of the Indian Ocean (M.O. 519, 1949). 15¼ in. × 22 in. £3 3s. (11d.).

Indian Ocean Currents (M.O. 392, Second Edition 1939, reprinted 1950). 30 in. × 20 in. 10s. (3d.).

Pacific Ocean

Monthly Meteorological Charts of the Eastern Pacific (M.O. 518, 1950). 17 in. × 23½ in. £4 4s. (1s. 4d.).

Monthly Meteorological Charts of the Western Pacific (M.O. 484, 1947). 16¾ in. × 24 in. £2 2s. (1s.).

Monthly Sea Surface Temperatures of Australian and New Zealand Waters (M.O. 516, 1949). 19¾ in. × 12¼ in. 10s. (3d.).

Quarterly Surface Current Charts of the Western North Pacific Ocean, Westward of Long. 160°W., with Monthly Chartlets of the China Seas (M.O. 485, 1949). 21 in. × 16 in. £1 5s. (5d.).

South Pacific Ocean Currents (M.O. 435, 1938, reprinted 1944). 34½ in. × 24 in. 7s. 6d. (6d.).

Arctic Ocean

Monthly Ice Charts of the Arctic Seas (M.O.M 390a, revised 1944). 12 in. × 7 in. 3s. 6d. (3d.).

Prices in brackets give postage (inland)

Publications in this list are obtainable direct from H.M. Stationery Office at the addresses shown on the title page, or from any bookseller.

AN OFFICIAL PUBLICATION

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7th Edition : June 1950

PART II OF THE MANUAL OF METEOROLOGICAL OBSERVING

THE handbook was written for three purposes: (1) To assist officers in British Commonwealth vessels, who carry out voluntarily observations at sea for the meteorological services, to do the work in the most efficient and uniform way. (2) As an encouragement and help to all mariners interested in meteorology. (3) To provide a reference book for those taking Masters' and Mates' examinations.

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ABRIDGED LIST OF PUBLICATIONS OF THE METEOROLOGICAL OFFICE

Publications may be ordered from the Sale Offices of His Majesty's Stationery Office at the addresses shown on the title page or through any bookseller

Cloud Forms. Definitions and descriptions, with photographs of clouds. M.O. 233, 6th Edition, 1949. 1*s.* 3*d.* (1*s.* 4*d.*) *Out of stock, being reprinted.*
Amendment List No. 1 (1950). 1*d.* (2*d.*)

Weather Map. An introduction to modern meteorology. M.O. 225 i, 3rd edition, 1939; reprinted 1950 (see also Meteorological Glossary, in continuation of the "Weather Map"). 3*s.* 6*d.* (3*s.* 9*d.*)

Meteorological Glossary (continuation of the "Weather Map", *q.v.*). M.O. 225 ii, 3rd edition, 1939; reprinted 1950. 8*s.* 6*d.* (8*s.* 11*d.*)

Handbook of Weather Messages, Codes and Specifications. M.O. 510.

Part I. Transmission schedules and station index numbers 1949. 2*s.* 6*d.* (2*s.* 8*d.*)
Part II. Codes and specifications. 1948. 1*s.* 6*d.* (1*s.* 8*d.*)
Part III. Coding, decoding and plotting. 1948. 2*s.* (2*s.* 2*d.*)
(*Amendments issued as necessary and priced separately.*)

Instructions for the preparation of weather maps with tables of the specifications and symbols. M.O. 515. 1949. 9*d.* (10*d.*)

International Meteorological Code adopted by the International Meteorological Organisation, Washington, 1947. **Decode for the use of shipping,** incorporating the code for weather reports from and to ships and the analysis code for the use of shipping. M.O. 509, 2nd edition, 1950. 1*s.* (1*s.* 1*d.*)

Meteorological Handbook for Pilots and Navigators. M.O. 448, 2nd edition, 1942; reprinted 1950. 2*s.* 6*d.* (2*s.* 9*d.*)

A Short Course in Elementary Meteorology. By W. H. Pick, B.Sc., F.C.P., F.Inst.P. M.O. 247, 5th edition, 1938; reprinted 1950. 2*s.* 6*d.* (2*s.* 9*d.*)

Meteorology of Airfields. By C. S. Durst, B.A. M.O. 507, 1949; reprinted 1950. 2*s.* (2*s.* 2*d.*)

Prices in brackets include postage